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TRANSACTIONS

OF THE

HERTFORDSHIRE NATURAL HISTORY SOCIETY.

VOL. XI.

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TRANSACTIONS

OF THE

HERTFORDSHIRE

NATURAL HISTORY SOCIETY

AND

FIELD CLUB.

EDITED BY JOHN HOPKINSON, F.L.S., F.G.S.,
Assoc. Inst. C. E., Sec. Ray Soc.

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CONTENTS.

PAGE

1. Hertfordshire Maps: a Descriptive Catalogue of the Maps of the County, 1579 to 1900. By HERBERT GEORGE FORDHAM. Introduction, and Catalogue, Part I: 1579–1673. (Plates I–VI.) 1
2. Report on the Rainfall in Hertfordshire in the Year 1900. By JOHN HOPKINSON, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C. E. 33
3. Notes on Lepidoptera observed in Hertfordshire in the Year 1900. By A. E. GIBBS, F.L.S., F.R.H.S. .. 43
4. Note on the Appearance of a Foreign Beetle (*Diaxenes dendrobii*) at Watford. By AUBREY STAWELL-STOYEL .. 46
5. Notes on Birds observed in Hertfordshire during the Year 1900. By ALAN F. CROSSMAN, F.L.S., F.Z.S., M.B.O.U. 47
6. Report on Phenological Phenomena observed in Hertfordshire during the Year 1900. By EDWARD MAWLEY, Sec. R. Met. Soc., F.R.H.S. 53
7. Ostracoda from the *Chara*-Marl of Hitchin. By FREDERICK CHAPMAN, A.L.S., F.R.M.S. 60
8. Further Note on the Palæolithic Deposits at Hitchin. By CLEMENT REID, F.R.S., F.L.S., F.G.S. 63
9. Meteorological Observations taken in Hertfordshire in the Year 1900. By JOHN HOPKINSON, F.L.S., F.G.S., F. R. Met. Soc., Assoc. Inst. C. E. 65
10. List of the Lepidoptera of Cheshunt and its Neighbourhood. By W. C. BOYD 75
11. List of Works on the Geology of Hertfordshire, 1884–1900. By JOHN HOPKINSON, F.L.S., F.G.S., Assoc. Inst. C. E. 87
12. Address.—Progress during the Nineteenth Century. By the President, LEWIS EVANS, F.S.A., F.R.A.S. 105
13. Notes on the Fish of the Upper Lea. By JAMES SAUNDERS, A.L.S. 119
14. The Climate of Hertfordshire, deduced from Meteorological Observations taken during the Twelve Years 1887–1898. By JOHN HOPKINSON, F.L.S., F.G.S., F. R. Met. Soc., Assoc. Inst. C. E. (Plate VII.) 121

Digitized by Google

PAGE

15. Report on Phenological Phenomena observed in Hertfordshire during the Year 1901. By Edward Mawley, Vice-Pres. R. Met. Soc., F.R.H.S. 135
16. Notes on Birds observed in Hertfordshire during the Year 1901. By William Bickerton 142
17. Meteorological Observations taken in Hertfordshire in the Year 1901. By John Hopkinson, F.L.S., F.G.S., F. R. Met. Soc., Assoc. Inst. C. E. 145
18. Report on the Rainfall in Hertfordshire in the Year 1901. By John Hopkinson 155
19. Notes on Lepidoptera observed in Hertfordshire in the Year 1901. By A. E. Gibbs, F.L.S., F.R.H.S. .. 165
20. Hertfordshire Maps: a Descriptive Catalogue of the Maps of the County, 1579 to 1900. By Herbert George Fordham. Part II: 1673–1794 (*to be continued*). (Plate VIII.) 173
21. Meteorological Observations taken in Hertfordshire in the Year 1902. By John Hopkinson, F.L.S., F.G.S., F. R. Met. Soc., Assoc. Inst. C. E. 213
22. Notes on the Habits of some of our Lepidopterous Insects. By Arthur Cottam, F.R.A.S. 222
23. Report on the Rainfall in Hertfordshire in the Year 1902. By John Hopkinson, F.L.S., F.G.S., F. R. Met. Soc., Assoc. Inst. C. E. 227
24. On the Shrinkage of the Upper Sources of the River Lea. By James Saunders, A.L.S. 236
25. Some Recent Storms and Floods in Hertfordshire. By John Hopkinson, F.L.S., F.G.S., F. R. Met. Soc. .. 239
26. The Meteor of the 13th of July, 1902. By John Hopkinson and Alfred Latchmore 244

Index, etc. 245

Proceedings, October, 1900, to December, 1902, pp. ix–xliv.

[To be inserted, in binding, before the Transactions.]

Digitized by Google

LIST OF ILLUSTRATIONS.

PLATES.

I. England and Wales, 1635.. *Frontispiece*, or *to face p.* 1
II. Hertfordshire, 1598 .. .. .. *Between* pp. 12 *and* 13
III. Plan of Hertford, 1611 .. .. ,, ,, 14 ,, 15
IV. View of St. Albans and Plan of Verulamium, 1611 *Between* pp. 14 *and* 15
V. Hertfordshire, 1617 .. .. *To face p.* 17
VI. Thumb-nail Map of Hertfordshire with Table of Distances, 1635 .. .. *To face p.* 20
VII. Map of Hertfordshire showing its Climatological Stations, 1887–1898 .. .. *To face p.* 121
VIII. Hertfordshire, 1704.. .. .. *Between* pp. 172 *and* 173

OTHER ILLUSTRATIONS.

PAGE
Initial letter H, 1611 1
Arms of Hertford, 1720 11
Royal Coat of Arms, Blaeu, 1648 32

Digitized by Google

Dates of publication of the several parts contained in this volume :

Part 1.	Pages 1–32		October, 1901.
,, 2.	,, 33–64		December, 1901.
,, 3.	,, 65–104		March, 1902.
,, 4.	,, 105–144		June, 1902.
,, 5.	,, 145–172, and ix–xii		October, 1902.
,, 6.	,, 173–212		April, 1903.
,, 7.	,, 213–244		August, 1903.
,, 8.	,, xiii–xliv		October, 1903.
,, 9.	,, i–viii, and 245–252		November, 1903.

Dates of publication of previous volumes :

TRANSACTIONS OF THE WATFORD NATURAL HISTORY SOCIETY.

Vol. I.	(pp. lxiv and 248.)		August, 1878.
,, II.	(pp. lx and 260.)		June, 1880.

TRANSACTIONS OF THE HERTFORDSHIRE NATURAL HISTORY SOCIETY.

Vol. I.	(pp. lxviii and 272.).....		May, 1882.
,, II.	(pp. lxviii and 286.).....		May, 1884.
,, III.	(pp. lxxii and 274.)		March, 1886.
,, IV.	(pp. lii and 224.)		June, 1888.
,, V.	(pp. xlviii and 224.).....		May, 1890.
,, VI.	(pp. lxx and 204.)		July, 1892.
,, VII.	(pp. lii and 244.)		April, 1894.
,, VIII.	(pp. lxxii and 212.)		November, 1896.
,, IX.	(pp. lxxviii and 252.)		August, 1898.
,, X.	(pp. lxxvi and 248.).....		July, 1901.

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PROCEEDINGS

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216TH ORDINARY MEETING, 23RD OCTOBER, 1900, AT WATFORD.

THE RIGHT HONOURABLE THE EARL OF VERULAM, President, in the Chair.

Mr. Philip J. Barraud, Bushey Heath, and Mr. E. G. Elliman, 67, The Broadway, Chesham, were proposed for membership of the Society.

The President, on behalf of the Society, presented to Mr. John Hopkinson an illuminated copy of the resolution passed at the last Anniversary Meeting thanking him for his twenty-five years' services to the Society.

Professor Attfield spoke in appreciation of the presentation, and Mr. Hopkinson, in accepting it, tendered his thanks to the President and Professor Attfield, and to the members generally.

The following paper was read:—

"A Descriptive Catalogue of the Maps of the County of Hertford, Part I." By Herbert George Fordham. (*Transactions*, Vol. XI, pp. 1–32.)

Collections of Hertfordshire Maps were exhibited by Mr. Lewis Evans, F.S.A., Mr. W. F. Andrews, and Mr. Hopkinson.

Mr. Fordham showed a collection of topographical works and a set of impressions from the blocks prepared for the illustration of his catalogue.

217TH ORDINARY MEETING, 25TH OCTOBER, 1900, AT ST. ALBANS.

THE VERY REV. WALTER J. LAWRANCE, M.A., Dean of St. Albans, in the Chair.

Mr. Philip J. Barraud and Mr. E. G. Elliman were elected Members of the Society.

The following lecture was delivered:—

"Our National Heritage." By Hugh Blakiston, B.A., Secretary of the National Trust for the Preservation of Places of Historic Interest or Natural Beauty.

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The lecture was illustrated by lantern photographs of old buildings and of beautiful bits of country which had been acquired by the National Trust, whose claims for support Mr. Blakiston urged.

The meeting was held in conjunction with the St. Albans Architectural and Archæological Society.

218TH ORDINARY MEETING, 20TH NOVEMBER, 1900, AT WATFORD.

ALAN F. CROSSMAN, F.L.S., F.Z.S., M.B.O.U., Vice-President, in the Chair.

The following paper was read:—

"The Functions of a Natural History Society considered with Special Reference to the Hertfordshire Natural History Society." By T. E. Lones, M.A., LL.D., B.Sc.

A discussion ensued in which the Chairman, Mr. Hopkinson, Mr. G. P. Neele, and Mr. W. R. Carter took part.

219TH ORDINARY MEETING, 22ND JANUARY, 1901, AT WATFORD.

ALAN F. CROSSMAN, F.L.S., F.Z.S., M.B.O.U., Vice-President, in the Chair.

Mr. Charles Worte, 17, Derby Road, Watford, was proposed for membership of the Society.

The Chairman announced that the Watford Urban District Council had kindly granted the use of the room in which they were assembled for all future meetings of the Society held at Watford. (The use of this room had been granted on two previous occasions—for the last Anniversary Meeting and for the Ordinary Meeting on the 23rd of October, 1900.)

The following lecture was delivered:—

"Haunts and Habits of British Birds." By Richard Kearton, F.Z S.

The lecture was copiously illustrated by lantern-views of birds in their haunts and of scenes showing the difficulties which Mr. Kearton and his brother had to contend with in photographing the birds, many of them while sitting on their nests.

The oxy-hydrogen lantern was manipulated by Mr. Harold King Smith.

After a vote of thanks had been accorded to Mr. Kearton for his lecture and to Mr. Smith for showing the views, the Chairman called upon Professor Attfield to make an announcement.

The Professor, who had entered the room during the lecture, in feeling terms announced that Her Majesty Queen Victoria had died shortly before the opening of the meeting of the Society.

The Chairman said that in consequence of this sad news the meeting would at once adjourn.

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26TH ANNIVERSARY MEETING, 26TH MARCH, 1901. (AT WATFORD.)

ALAN F. CROSSMAN, F.L.S., F.Z.S., M.B.O.U., Vice-President, in the Chair.

The Report of the Council for the year 1900, and the Treasurer's Account of Income and Expenditure, were read and adopted.

The following gentlemen were duly elected as the Officers and Council for the ensuing year:—

President.—Lewis Evans, F.S.A., F.R.A.S.

Vice-Presidents.—Prof. John Attfield, M.A., Ph.D., F.R.S., F.I.C.; Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U.; the Right Honourable the Earl of Verulam; William Whitaker, B.A., F.R.S., F.G.S., Assoc. Inst. C. E.

Treasurer.—John Weall.

Honorary Secretaries.—A. E. Gibbs, F.L.S., F.R.H.S.; T. E. Lones, M.A., LL.D., B.Sc.

Editor.—John Hopkinson, F.L.S., F.G.S., F.R.M.S., F.R. Met. Soc., Assoc. Inst. C. E.

Librarian.—Daniel Hill, F.R.H.S.

Other Members.—W. R. Carter, B.A.; Edward M. Chater; Alfred E. Cox, M.R.C.S., L.R.C.P.; Arthur E. Ekins, F.C.S., F.I.C.; Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S., V.P.S.A., etc.; W. Gruggen, L.R.C.P.E.; George P. Neele; James K. Riggall; George Rooper, F.Z.S.; F. W. Silvester; G. H. Wailes, Assoc. M. Inst. C.E.; E. T. Wilks, F.R.G.S.

The thanks of the Society were accorded to the Right Honourable the Earl of Verulam, retiring from the office of President; to Sir John Evans, K.C.B., F.R.S., retiring from the office of Vice-President; to Mr. W. R. Carter, B.A., retiring from the office of Honorary Secretary; and to Dr. John Morison, F.G.S., Mr. James Saunders, A.L.S., and Mr. W. Lepard Smith, retiring from the Council.

REPORT OF THE COUNCIL FOR THE YEAR 1900.

The Society has now completed its 26th year, and the Council has the pleasure to report that the year 1900 has seen considerable interest taken by the members in its proceedings, both in the winter evening meetings and in the summer field meetings.

During the year the Society has elected as an Honorary Member Thomas McKenny Hughes, M.A., F.R.S., F.S.A., F.G.S., Professor of Geology in the University of Cambridge, and eight ordinary members; the names of twenty-five ordinary members have been removed from the list, either by their resignation or for non-payment of subscription for several years; and the Council has to record the loss of five others by death, including one Honorary Member,

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Mr. George James Symons, F.R.S., President of the Royal Meteorological Society, who passed away on the 10th of March in his 62nd year.

Founder of the most extensive organization in the world for any scientific purpose, his army of rainfall observers in the British Isles numbering over 3,000, Mr. Symons was best known as our greatest authority on rainfall, but he had a wonderful knowledge of every department of meteorology and of almost every subject connected with it. An excellent organizer, he was also most energetic and methodical, and was thus enabled to do a vast amount of work. He started an organization in 1857 for observing and recording thunderstorms. His first published volume of 'British Rainfall' contained the records for the year 1860, and in 1866 he commenced the publication of the 'Monthly Meteorological Magazine,' contributing at least one article to every number which appeared up to the time of his death. Your Editor consulted him in 1875 with regard to establishing a meteorological observatory at Watford, and he is but one of many who have gone to him on a similar errand, and perhaps but one of many who have thus commenced with him a friendship lasting until his death. He was elected an honorary member of this Society in 1876, and in 1883 he gave a lecture at Watford on "Meteorology and some Connected Subjects" (Trans., Vol. III, pp. ix–xiii). His disposition was most genial, and in the many scientific Societies on which he was at one time or other a member of the governing body, he never made an enemy. He was Honorary Secretary of the Royal Meteorological Society for twenty-four years and President for three years, and had again been elected President in January as best suited to fill that office during the jubilee year of the Society. It is proposed to found as a memorial to him a gold medal to be awarded from time to time (probably biennially) by the Council of the Royal Meteorological Society in recognition of distinguished work in meteorological science.

The census of the Society at the end of the years 1899 and 1900 was as follows:—

	1899.	1900.
Honorary Members	15	15
Corresponding Members	3	3
Life Members	46	44
Annual Subscribers	140	120
	204	182

The following papers or lectures have been read or delivered at Watford during the year:—

Jan. 16.—Notes on the Place-names and Field-names of the Parish of Watford, Herts; by Percy Manning, M.A., F.S.A.

—— Report on the Conference of Delegates to the British Association at Dover in 1899; by John Hopkinson, F.L.S., F.G.S., Assoc. Inst. C.E.

March 20.—Anniversary Address; by the President, the Right Honourable the Earl of Verulam.

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April 10.—Report on Phenological Phenomena observed in Hertfordshire during the Year 1899; by Edward Mawley, Sec. R. Met. Soc.

—— The Habitats of the Mycetozoa; by James Saunders, A.L.S., and E. Saunders.

—— Notes on Lepidoptera observed in Western Hertfordshire in 1897, 1898, and 1899; by Arthur Cottam, F.R.A.S.

—— A Curious Instance of the Labour-saving Instinct in the Leaf-cutting Bees; by Aubrey C. Stoyel.

—— Notes on Birds observed in Hertfordshire during the Year 1899; by Alan F. Crossman, F.L.S., F.Z.S.

—— Notes on Curious Nesting-places; communicated by John Hopkinson, F.L.S., F.G.S.

Oct. 23.—Hertfordshire Maps: a Descriptive Catalogue of the Maps of the County, 1579 to 1900 (Part 1, 1579–1673); by Herbert George Fordham.

Nov. 20.—The Functions of a Natural History Society considered with special reference to the Hertfordshire Natural History Society; by T. E. Lones, M.A., LL.D., B.Sc.

The following lecture was delivered at St. Albans:—

Oct. 25.—Our National Heritage; by Hugh Blakiston, B.A., Secretary of the National Trust for the Preservation of Places of Historic Interest or Natural Beauty.

The following annual reports, not read at any meeting of the Society, have been printed in the 'Transactions':—

Meteorological Observations taken in Hertfordshire in the Year 1899; by John Hopkinson, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C.E.

Report on the Rainfall in Hertfordshire in the Year 1899; by John Hopkinson.

The following Field Meetings were held during the year:—

May 5.—Arlesey and Hitchin.	June 2.—St. Albans.
—— 19.—Aldbury.	—— 16.—Rothamsted, Harpenden.
—— 26.—Kew Gardens.	—— 30.—Ruislip Reservoir.

The meeting on May 5th was held in conjunction with the Geologists' Association.

The Society is indebted to the late Sir John Lawes and to Sir Henry Gilbert for permission to visit the Experimental Farm at Rothamsted, and to Mr. J. J. Willis for conducting the party on the occasion; also to Mr. A. E. Gibbs for hospitality at St. Albans.

Two parts of the tenth volume of the present series of the 'Transactions' have been published during the year, containing 80 pages and one plate with other illustrations, and it is intended to complete the volume and commence another in the present year.

The usual exchange of Transactions has been made, and several State publications, as well as those of the learned societies, have been added to the Library. The Society's books are still stored in the old Board Room of the Watford Urban District Council, but this arrangement must be looked upon as a temporary one, for the room is so inaccessible that the Library is now very little used by the members. A list of additions made to the Library during the year 1900 is appended to this Report.

The balance-sheet shows that the funds of the Society are in a satisfactory condition. There was at the end of the year a balance in hand of about £18, and the income has exceeded the expenditure

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INCOME AND EXPENDITURE FOR THE YEAR 1900.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from 1899	8	0	5	By Printing 'Transactions'	26	6	9
,, Entrance Fees	2	0	0	,, Miscellaneous Printing	4	8	8
,, Subscriptions for 1897	0	10	0	,, Expenses of Meetings	2	14	3
,, ,, ,, 1898	1	0	0	,, Library Expenses	7	7	9
,, ,, ,, 1899	4	10	0	,, Salary of Assistant	5	0	0
,, ,, ,, 1900	50	10	0	,, Postages and Carriage of Parcels	9	3	5
,, ,, ,, 1901	4	10	0	,, Stationery and Sundries	1	14	0
,, Dividends on £130 India 3 per cent. Stock	3	18	0	,, Fire Insurance Premium	0	12	6
,, Sale of 'Transactions' and 'Flora of Hertfordshire'	1	8	8	,, Symons' Memorial Fund	1	1	0
				,, Balance at Bank	17	18	9
	£76	7	1		£76	7	1

Amount invested in the purchase of £130 India 3 per cent. Stock . . . . £126 15*s.* 6*d.*

Audited and found correct this 13th day of February, 1901, { E. T. BURR, E. H. JACKSON.

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by £10. This is owing to a less number of parts of the 'Transactions' than usual having been printed during the year, and an increased expenditure on this head must be anticipated in the present year.

The best thanks of the Society are due to the Watford Urban District Council for the generous grant of the free use of the Council Chamber for the Society's evening meetings.

Additions to the Library in 1900.

Presented.

Assam Gazette, 21st August, 1897. Fo. (Contains) General Report on the Earthquake of 12th June, 1897 .	*Dr. Eteson.*
British Association for the Advancement of Science. Report for 1899 (Dover). 8vo. London, 1900 . .	*The Association.*
Evans, Sir John. Egypt Exploration Fund. Address by the President. 8vo. London, 1900	*The Author.*
———. Origin, Development, and Aims of our Scientific Societies. (*Journ. Soc. Arts*, 1900.)	,,
———. Palæolithic Man in Africa. (*Proc. Royal Soc.*, 1900.)	,,
Symons' Monthly Meteorological Magazine. Vol. xxxv. 8vo. London, 1900	*Dr. H. R. Mill.*

Received in Exchange.

American Museum of Natural History. Report for the Year 1899. 8vo. New York, 1900.

———. Bulletin. Vol. xi, part 3; vol. xii, part 1. *Ib.*

Bath Natural History and Antiquarian Field Club. Proceedings. Vol. ix, part 3. 8vo. Bath, 1900.

Birmingham Natural History and Philosophical Society. Proceedings. Vol. x, parts 1, 2; vol. xi, part 1. 8vo. Birmingham, 1896–98.

———. Journal. Vol. ii, parts 1–12. *Ib.* N.D.

Bristol Naturalists' Society. Proceedings. N.S. Vol. ix, part 1. 8vo. Bristol, 1900.

Cardiff Naturalists' Society. Report and Transactions. Vol. xxxi. 8vo. Cardiff, 1900.

Croydon Microscopical and Natural History Club. Proceedings, 1899–1900. 8vo. Croydon, 1900.

Edinburgh. Botanical Society. Transactions and Proceedings. Vol. xxxi, part 4. 8vo. Edinburgh, 1900.

———. Royal Physical Society. Proceedings. Session 1898–1900. 8vo. Edinburgh, 1900.

Glasgow Natural History Society. Transactions. Vol. v, part 3. 8vo. Glasgow, 1900.

———, Philosophical Society of. Proceedings. Vol. xxxi. 8vo. Glasgow, 1900.

London, Geological Society of. Abstracts of the Proceedings. Session 1899–1900. 8vo. London, 1900.

———, Linnean Society of. Proceedings. Session 1899–1900. 8vo. London, 1900.

———. Quekett Microscopical Club. Journal. Ser. 2, vol. vii, Nos. 46, 47. 8vo. London, 1900.

———. Royal Meteorological Society. Quarterly Journal. Vol. xxvi. 8vo. London, 1900.

———. Royal Microscopical Society. Journal, 1900. 8vo. London, 1900.

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Manchester Field Naturalists' and Archæologists' Society. Report and Proceedings for 1899. 8vo. Manchester, 1900.

——— Geographical Society. Journal. Vol. xv, Nos. 10–12; vol. xvi, Nos. 1–3. 8vo. Manchester, 1900.

——— Geological Society. Transactions. Vol. xxvi, parts 10–12, 14–19. 8vo. Manchester, 1900.

——— Literary and Philosophical Society. Memoirs and Proceedings. Vol. xliii, part 5; vol. xliv, part 1. 8vo. Manchester, 1899–1900.

New York Academy of Sciences. Annals. Vol. xii, parts 2, 3. 8vo. New York, N.D.

———. The Devonian Lamprey. Fo. New York, N.D.

Norfolk and Norwich Naturalists' Society. Transactions. Vol. vii, part 1. 8vo. Norwich, 1900.

Northamptonshire Natural History Society. Journal. Nos. 77-79. 8vo. Northampton, 1900.

Philadelphia Academy of Natural Sciences. Proceedings, 1900. Parts 1–3. 8vo. Philadelphia, 1900.

Rochester Academy of Sciences. Proceedings. Vol. iii. 8vo. Rochester, N.Y., 1900.

Rugby School Natural History Society. Report for the Year 1899. 8vo. Rugby, 1900.

Somersetshire Archæological and Natural History Society. Proceedings. Vols. iii, v, vi. 8vo. Taunton, 1897, 1899, 1900.

United States Department of Agriculture. Bulletin, No. 12.—Legislation for the Protection of Birds other than Game Birds. 8vo. Washington, 1900. Bulletin, No. 13.—Food of the Bobolink, etc. *Ib.*

———. North American Fauna. No. 17, Revision of American Voles. 8vo. Washington, 1900. No. 18, Revision of Pocket Mice. *Ib.* No. 19, Biological Reconnaisance in the Yukon River District. *Ib.*

United States Geological Survey. 19th Annual Report, for 1897–98. Part 2, Papers chiefly of a Theoretic Nature. 4to. Washington, 1899. Part 3, Economic Geology. *Ib.* Part 5, Forest Resources. *Ib.* Atlas to accompany the above. Fo. *Ib.*

———. 20th Annual Report, for 1898–99. Part 1, Director's Report, by C. D. Walcott. 4to. Washington, 1899. Part 6, Mineral Resources of the United States, by D. T. Day. *Ib.* Part 6, continued, by W. C. Day. *Ib.*

———. Bulletins. No. 159.—The Geology of Massachusetts, Eastern Berkshire County; by B. K. Emerson. 8vo. Washington, 1899. No. 160.—Dictionary of Altitudes in the United States; by H. Gannett. *Ib.* No. 161.—The California Earthquake in 1898; by C. D. Perrin. *Ib.* No. 162.—Bibliography and Index of North American Geology, Palæontology, Petrology, and Mineralogy; by F. H. Weeks. *Ib.*

———. Monographs. Vol. xxxii, part 2.—Geology of Yellowstone National Park. 4to. Washington, 1899. Vol. xxxiii.—Geology of the Narragansett Basin. *Ib.* Vol. xxxiv.—Glacial Gravels of Maine. *Ib.* Vol. xxxvi.—Iron-bearing District of Michigan Crystal Falls. *Ib.* Vol. xxxvii.—Fossil Flora of the Lower Coal-Measures of Missouri. *Ib.* Vol. xxxviii.—Illinois Glacial Lobe. *Ib.*

Upsala, Geological Institution of the University of. Bulletin. Vol. vi, part 2. 8vo. Upsala, 1900.

Washington. Smithsonian Institution. Annual Report for the Year ending 30th June, 1897. Report of the National Museum, part 1. 8vo. Washington, U.S.A., 1899.

Wiltshire Archæological and Natural History Magazine. Vol. xxx, No. 92. 8vo. Devizes, 1899.

Yorkshire Geological and Polytechnic Society. Proceedings. N.S. Vol. xiv, part 1. 8vo. Leeds, N.D.

——— Naturalists' Union. The Alga-Flora of Yorkshire, by W. West and G. S. West. 8vo. Leeds, 1900.

——— ———. Naturalist. N.S. Vol. xxv. 8vo. Leeds, 1900.

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PURCHASED.

BOTANY, JOURNAL OF. Vol. xxxviii. 8vo. London, 1900.
HOME COUNTIES MAGAZINE. Vol. ii. 8vo. London, 1900.
McINTOSH, Prof. W. C. British Annelids. Part 2. (*Ray Society.*) Fo. London, 1900.
NATURE NOTES. Vol. xi. (*Selborne Society.*) 8vo. London, 1900.
NOVITATES ZOOLOGICÆ. Vol. vii. 8vo. Tring, 1900.
YEAR-BOOK of the Scientific and Learned Societies of Great Britain and Ireland. . . . 1899. 8vo. London, 1900.
ZOOLOGIST. 4th Series. Vol. iv. 8vo. London, 1900.

220TH ORDINARY MEETING, 26TH MARCH, 1901, AT WATFORD.

ALAN F. CROSSMAN, F.L.S., F.Z.S., M.B.O.U., Vice-President, in the Chair.

Mr. Charles Worte was elected a Member of the Society.

Mr. John Hunt, Melrose, St. John's Road, Watford, was proposed for membership.

The following papers were read:—

1. "Notes on Lepidoptera observed in Hertfordshire in the Year 1900." By A. E. Gibbs, F.L.S., F.R.H.S. (*Transactions*, Vol. XI, pp. 43–45.)

Lepidoptera taken in the neighbourhood of Watford in 1900 were exhibited by Mr. Arthur Cottam, and specimens of the Camberwell beauty (*Vanessa antiopa*) taken at St. Albans in 1900 were lent for exhibition by Mr. J. Tomlin, in illustration of the paper.

2. "Note on the Appearance of a Foreign Beetle (*Diaxenes dendrobii*) at Watford." By Aubrey C. Stawel-Stoyel. (*Transactions*, Vol. XI, p. 46.)

The author exhibited specimens of the beetle.

3. "Notes on Birds observed in Hertfordshire during the Year 1900." By Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U. (*Transactions*, Vol. XI, pp. 47–52.)

4. "REPORT ON THE CONFERENCE OF DELEGATES TO THE BRITISH ASSOCIATION AT BRADFORD IN 1900." By JOHN HOPKINSON, F.L.S., F.G.S., Assoc. Inst. C.E.

The representation of a Provincial Scientific Society at the annual meetings of the British Association confers upon that Society certain advantages and carries with it specific obligations. The Societies thus represented receive the Reports of the Association; their publications are catalogued in those Reports, the titles of the more important papers published by them, and especially those which give the results of local investigation, being indexed; and their Delegate, if not a member of the General Committee of the Association, becomes so *ex officio* during the meeting which he attends. In return each Society represented has to contribute

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a copy of the publication in which the papers for indexing appear; and the Delegate is expected to attend the Conferences, to report the proceedings to his Society, to send to the Secretary of the Corresponding Societies' Committee a printed copy of his report, and to endeavour to get his Society to carry on scientific investigations in its own area, especially such as may help the British Association Committees of Research.

It is to fulfil one of these obligations that, as the Society's Delegate to the Bradford meeting, I now have to report such proceedings at last year's Conference as may be of interest to our members or may indicate suitable fields of research.

The meetings of the Conference were held on the 6th and 11th of September. The Corresponding Societies' Committee of the Association was represented, amongst others, by two members of our Society, your Delegate at each meeting, and our past President, Mr. William Whitaker, at the second. At the first meeting Professor Poulton presided, and at the second Mr. Whitaker.

First Meeting.

The first business was the consideration of the Report of the Corresponding Societies' Committee. Being the last year of the nineteenth century, the Report opened with a review of the proceedings of the Conferences since they were reconstituted in 1885. From the first Conference in 1880 to the fifth in 1884 the 'Transactions' of our Society contain the only permanent record of the proceedings,* the first Conference officially recognised by the Council of the British Association being that held in 1885, from which time the proceedings have been recorded in the Reports of the Association. Suggestions as to improvements in the procedure at the Conferences were then discussed, and the names of four Societies added to the list were given, raising the number of Corresponding Societies to 75.

The Report gave rise to a long discussion on procedure, in which eighteen Delegates took part. In discussing subjects for debate it was mentioned that only one Society of the 75 responded to a request to suggest a subject for discussion at the present meeting, the subject suggested being Dew-ponds. It may be added that the Society nominally suggesting it was the Hertfordshire Natural History Society. The idea arose from a conversation which I had with Professor Miall at Leeds last Easter, when it was arranged that if I could get the subject accepted, he would open the discussion upon it.

The result of the debate was to leave things as they were, it being tacitly admitted that the Corresponding Societies' Committee made the best possible arrangements for the Conferences.

The only other subject discussed at this meeting was the question of copyright, which will probably be legislated upon in the present session of Parliament. Scientific Societies have no copyright in their publications unless they pay their contributors, the copyright

* 'Trans. Herts Nat. Hist. Soc.,' Vol. VI, pp. 45–47.

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being vested in the authors of the papers. It follows that if any part of our Transactions were to go out of print, the Society could not legally reprint it without the permission of the author of every paper in such part. In the Bill which will shortly be brought before Parliament it is proposed to make the insertion of abstracts of foreign scientific papers a breach of copyright. This is a retrograde step which would retard the progress of knowledge, and would weigh heavily on several scientific Societies which publish such abstracts to the great benefit of their members.

The following resolution was carried unanimously:—"That the matter of the proposed Copyright Bill be referred, through the Committee of Recommendations, to the General Committee, so far as it affects (1) the copyright of scientific Societies in their Transactions, and (2) the publication of abstracts of scientific papers; and that they be requested to take such action as will protect scientific Societies."

SECOND MEETING.

Dew-Ponds.—Professor L. C. Miall read a very interesting paper on the dew-ponds which abound in Sussex and Hampshire, and are not uncommon on the Chalk hills of Berkshire and Wiltshire, while there are few or none to be found on the Chalk hills of Hertfordshire, Bedfordshire, Lincolnshire, or Yorkshire. This, he thought, might be connected with the distance from the sea in a N.E.–S.W. line, for the south-west winds, which bring the chief part of our atmospheric moisture, can reach the South Downs almost direct from the sea, while they can only reach the Chalk hills of the Midlands and the North of England after traversing a great extent of country and crossing many ranges of hills. Professor Miall favoured the view that dew-ponds are to some extent replenished by dew, and not entirely by rain and mists.

The paper, which is published *in extenso* in the 'Report of the British Association for 1900,' gave rise to a long discussion in which twelve Delegates joined. It transpired from the remarks of Mr. Clement Reid that dew-ponds which best withstand a long drought have trees growing on their margin, and this appeared to be owing to dew forming on the trees and trickling down into the ponds, thus showing that such ponds are really to some extent fed by dew.

Your Delegate gave the result of some of his observations on the dew-ponds of the South Downs, favouring the view that they are almost entirely fed by rain or mist, pointing out how greatly the margin contributes to their replenishment, the receiving area being so much larger than the evaporating area, and stating that the level of the water in them was not nearly so constant as seemed to be supposed. This was shortly afterwards confirmed in the course of a cycle ride from Watford to Lyme Regis, when several dew-ponds were observed to be nearly dry, and none were seen with a less margin than the width of the surface of water, that is, without having at least nine times as much receiving as evaporating area.

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The scientific investigation of dew-ponds might have valuable economic results, enabling farmers to fix upon the best possible sites for them, and so prevent the waste of a considerable amount of money, for many are now made which prove to be useless in times of drought.

Geological Photographs.—Mr. Horace Monckton said that the Geological Photographs Committee wished to obtain the co-operation of the Corresponding Societies. The number of geological photographs in the British Association's collection was 2,655, the number received during the past year being 309, not including duplicates and lantern-slides. It was obvious that the taking of geological photographs was a work which could be most usefully done by members of the Societies. Very little has been done in Hertfordshire.

Erratic Blocks.—Mr. Monckton also asked for the co-operation of the Corresponding Societies with the Erratic Blocks Committee. Individual workers could, he said, greatly aid this investigation, but the most effective assistance would be given by the organization of local Boulder Committees. This Committee has been in existence for a good many years, and some members of our Society have contributed to it the results of their investigations, but we have done nothing in the matter for a long time. Perhaps our new Secretary, who is interested in superficial geology, might devise a plan by which Mr. Monckton's suggestion could be carried out.

Migration of Birds.—The Rev. E. P. Knubley said that Section D (Zoology) was anxious to encourage the Corresponding Societies in the observation of birds, especially their migration. It was now known that the common thrush went backwards and forwards from our Islands during about ten months of the year. It was also found that the wagtail came regularly along the western coast, but was unknown on the east. It was desirable that they should learn how long the commonest English birds sat upon their eggs before hatching them. No one at present could answer that question. The subject of the food-supply of birds was also one which might well be studied. Fortunately we have an active ornithological recorder, although his army of correspondents is not so large as could be desired. There is plenty of work for him and them in Mr. Knubley's suggestions, by the carrying out of which our knowledge of the habits of birds might be materially increased.

Anthropological Photographs.—Mr. Sidney Hartland spoke on behalf of the Anthropological Photographs Committee, saying that the Committee thought that there must be in all parts of the country a considerable number of photographs of this kind which were of interest to students but were not at present available. They wanted photographs of prehistoric stone monuments, stone implements, primitive pottery, and of objects connected with local superstitions, etc. The existence of objects of this kind in local museums was often known only to local men, but the Committee wished to make them available for all students of anthropology.

Corresponding Societies.—Some points with regard to the relation of these with the British Association were brought forward by

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Mr. Sowerbutts, who urged more strict compliance with the obligations mentioned at the commencement of this report, especially as to the duty of the Delegates to report to their Societies on the subjects on which the British Association desired their co-operation, and to send a copy of their report to the Secretary of the Corresponding Societies' Committee.

The Rev. J. O. Bevan urged the necessity of the Corresponding Societies "carrying on a systematic survey of their counties in respect to ethnography and ethnology, botany, meteorology, ornithology, archæology, folklore, etc." The subjects here mentioned are rather mixed and not sufficiently inclusive, for geology should be added and zoology substituted for ornithology, while four of them are embraced in the study of man.

The names and addresses of the Secretaries of the four Committees in the work of which the assistance of the Corresponding Societies was invited at this meeting are as follows:—

Geological Photographs Committee.—Professor W. W. Watts, M.A., F.G.S., Holm Wood, Bracebridge Road, Sutton Coldfield.

Erratic Blocks Committee.—Professor P. F. Kendall, F.G.S., Yorkshire College, Leeds.

Migration of Birds Committee.—Rev. E. P. Knubley, M.A., Steeple Ashton Vicarage, Trowbridge.

Anthropological Photographs Committee.—Mr. John L. Myers, M.A., F.S.A., Christ Church, Oxford.

Should any member of our Society communicate directly with the Secretary of any of the above Committees, it is requested that a copy of all observations made in Hertfordshire be also forwarded to one of the Secretaries or Recorders of the Society.

221ST ORDINARY MEETING, 23RD APRIL, 1901, AT WATFORD.

JOHN HOPKINSON, F.L.S., F.G.S., Assoc. Inst. C.E., in the Chair.

Mr. John Hunt was elected a Member of the Society.

The following papers were read:—

1. "Report on Phenological Phenomena observed in Hertfordshire during the Year 1900." By Edward Mawley, Sec. R. Met. Soc., F.R.H.S. (*Transactions*, Vol. XI, pp. 53–59.)

2. "Ostracoda from the Chara-Marl of Hitchin." By Frederick Chapman, A.L.S., F.R.M.S. (*Transactions*, Vol. XI, pp. 60–62.)

3. "Further Note on the Palæolithic Deposits at Hitchin." By Clement Reid, F.R.S., F.L.S., F.G.S. (*Transactions*, Vol. XI, pp. 63–64.)

4. "List of the Lepidoptera of Cheshunt and its Neighbourhood." By W. C. Boyd. (*Transactions*, Vol. XI, pp. 75–86.) [Introduction only read.]

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5. "List of Works on the Geology of Hertfordshire, 1884–1900." By John Hopkinson, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C.E. (*Transactions*, Vol. XI, pp. 87–104.) [Introduction only read.]

Field Meeting, 11th May, 1901.

TRING.

The Tring Zoological Museum and Tring Park were on this occasion visited for the third time by the kind permission of Lord Rothschild and his son the Honourable Walter Rothschild.* The meeting was under the direction of Dr. Lones, and the members, numbering twenty-seven, were conducted over the Museum by the principal curator, Mr. E. Hartert. Some came by train, some drove from St. Albans, and others cycled from Watford.

The Museum is in great part devoted to the exhibition of the larger Mammalia, amongst which were noticed zebras and antelopes, and the fiercer animals such as the lion, tiger, leopard, jaguar, and puma, and a lion-tiger hybrid. The Vertebrata are also represented by numerous birds, reptiles, and fishes, amongst the last-named a gigantic tarpan, one of the herring tribe, from Florida, attracting attention.

The only object of local interest noticed was a large nest of the hornet, *Vespa orabro*, with many specimens of the insect, from Watford. The hornet's nest is much more fragile than that of other species of *Vespa*, the wasps making their nests of a tenacious paper which they form out of the fibre of living trees, while the hornet contents itself with rotten wood, out of which it makes a very friable, russet-coloured paper.

The Museum consists of two departments, exhibition galleries, and a private collection for purposes of study, the source of a great part of the Hon. Walter Rothschild's splendid publication, 'Naturæ Novitates,' to which the Society subscribes. Certain portions of this collection were examined, including the skins of foreign birds and a large series of foreign butterflies and moths, Dr. K. Jordan, the second curator, showing the party some butterflies and moths of immense size and dazzling brilliancy obtained chiefly from Africa and New Guinea.

On leaving the Museum Mr. Hartert conducted the party through Tring Park, where many fine deer, some emus, and a large number of kangaroos, including young ones, were seen.

Tea was then partaken of at the "Rose and Crown," after which some of the members left and others drove, by way of Drayton Beauchamp, to the Wilstone, Tringford, and Marsworth Reservoirs, on which numerous water-birds were seen.

* For accounts of the two previous visits see 'Trans. Herts Nat. Hist. Soc.,' Vol. VIII, p. xxxiii (1895), and Vol. IX, p. lxxiii (1898).

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FIELD MEETING, 25TH MAY, 1901.

AYOT GREEN, BROCKET PARK, AND CROMER HYDE.

From Ayot Green the party, under the direction of Mr. A. E. Gibbs, walked across Brocket Park, keeping to the public footpath, as permission to wander elsewhere, which had been freely granted by former occupiers on previous occasions, could not be obtained. Moreover, a policeman was stationed at the bridge over the River Lea, with instructions to prevent anyone from lingering for a moment *on the public footpath*. On arriving at Cromer Hyde, tea was partaken of at the "Chequers."

Owing to the circumscribed field of operations and to a cold wind which prevailed, the entomologists had no sport, but the botanists found some interesting specimens, and the following is a list of the plants seen in flower during the ramble, Miss A. Hibbert-Ware acting as Recorder:—

Ficaria verna, *Huds.*
(*Ranunculus Ficaria*, L.)
Ranunculus acris, *L.*
,, auricomus, *L.*
,, bulbosus, *L.*
Chelidonium majus, *L.*
Barbarea vulgaris, *R. Br.*
Cardamine pratensis, *L.*
,, hirsuta, *L.*
Alliaria officinalis, *Andrz.*
Capsella Bursa-pastoris, *Mœnch*
Viola canina, *L.*
,, tricolor, *L.*
Melandrium silvestre, *Roehl.*
(*Lychnis diurna*, Sibth.)
,, pratense, *Roehl.*
(*L. vespertina*, Sibth.)
Silene cucubalus, *Wib.*
Cerastium vulgatum, *L.*
Stellaria media, *Cyr.*
,, Holostea, *L.*
Acer Pseudo-platanus, *L.*
,, campestre, *L.*
Geranium molle, *L.*
,, Robertianum, *L.*
Ilex Aquifolium, *L.*
Ulex europæus, *L.*
Medicago apiculata, *Willd.*
(*M. maculata*, Sibth.)
,, lupulina, *L.*
Trifolium pratense, *L.*
,, procumbens, *L.*
Orobus tuberosus, *L.*
(*Lathyrus macrorrhizus*, Wimm.)
Vicia sepium, *L.*
,, ,, *var.* alba
,, sativa, *L.*
Fragaria vesca, *L.*
Potentilla Tormentilla, *Neck.*
,, Fragariastrum, *Ehrh.*
Poterium Sanguisorba, *L.*
Cratægus oxyacantha, *L.*
Saxifraga granulata, *L.*
Anthriscus vulgaris, *Pers.*
(*Chærophyllum anthriscus*, Lam.)
Scandix Pecten-veneris, *L.*
Conopodium denudatum, *Koch*
Sambucus nigra, *L.*
Galium Aparine, *L.*
Valerianella olitoria, *Poll.*
Senecio vulgaris, *L.*
Leucanthemum vulgare, *Lam.*
(*Chrysanthemum Leucanthemum*, L.)
Bellis perennis, *L.*
Taraxacum officinale, *Weber*
Hieracium Pilosella, *L.*
Myosotis intermedia, *Link*
(*M. arvensis*, Lehm.)
Veronica officinalis, *L.*
,, Chamædrys, *L.*
,, hederæfolia, *L.*
Ajuga reptans, *L.*
Lamium album, *L.*
,, purpureum, *L.*
Galeobdolon luteum, *Huds.*
(*Lamium Galeobdolon*, Crantz)
Glechoma hederacea, *L.*
(*Nepeta Glechoma*, Benth.)
Plantago lanceolata, *L.*
Rumex Acetosa, *L.*
,, Acetosella, *L.*
Mercurialis perennis, *L.*
Urtica dioica, *L.*
Quercus pedunculata, *Ehrh.*
(*Q. Robur*, L.)
Listera ovata, *R. Br.*
Scilla nutans, *Sm.*
Allium ursinum, *L.*
Luzula campestris, *DC.*
Arum maculatum, *L.*

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Field Meeting, 1st June, 1901.

THE GROVE, WATFORD.

This meeting was held in Grove Park and the Grove Woods by the kind permission of the Earl of Clarendon, and was under the direction of Mr. Hopkinson. The party, thirty-five in number, assembled at the principal entrance to the park, which was crossed by way of the ornamental water, an expansion of the River Gade, a detour having there to be made as the bridge on the carriage-drive was under repair.

On arriving at The Grove the private grounds were visited, and here some lofty trimmed hedges of yew, a hawthorn with three different kinds of flowers, coloured white, pink, and deep red, and a laburnum with numerous flowers of a heliotrope colour and some red ones, attracted attention.

A pretty walk through the woods followed, and the well-known "Temple-of-Pan," a rustic summer-house overshadowed by tall fir-trees, was visited. Near it, Solomon's seal (*Polygonatum multiflorum*) was seen in flower, and also the early purple orchis (*Orchis mascula*). In another part of the woods a wayfaring-tree (*Viburnum lantana*) was noticed.

On arriving at the keeper's house, "The Firs," his "Museum" of predaceous birds and mammals, slung between two trees, attracted attention, and then a picnic tea was provided in the orchard by Mrs. Hopkinson. After tea the keeper conducted the members through woods which had not before been visited, and into Cassiobury Park, which was crossed by those who were not cycling, the cyclists returning to Watford and elsewhere by Grove Mill Lane.

The following is a list of the birds which were seen or heard in the course of the walk, and recorded by Mr. A. F. Crossman :—

Missel-Thrush (*Turdus viscivorus*)
Song-Thrush (*T. musicus*)
Blackbird (*T. merula*)
Redbreast (*Erithacus rubecula*)
Nightingale (*Daulias luscinia*)
Whitethroat (*Sylvia cinerea*)
Chiffchaff (*Phylloscopus rufus*)
Willow-Warbler (*P. trochilus*)
Hedge-Sparrow (*Accentor modularis*)
Great Tit (*Parus major*)
Coal Tit (*P. ater*)
Blue Tit (*P. cæruleus*)
Wren (*Troglodytes parvulus*)
Tree-Creeper (*Certhia familiaris*)
Tree-Pipit (*Anthus trivialis*)
Spotted Flycatcher (*Muscicapa grisola*)
Swallow (*Hirundo rustica*)
House-Martin (*Chelidon urbica*)
Sand-Martin (*Cotile riparia*)
Greenfinch (*Ligurinus chloris*)
House-Sparrow (*Passer domesticus*)
Chaffinch (*Fringilla cœlebs*)
Yellowhammer (*Emberiza citrinella*)
Starling (*Sturnus vulgaris*)
Jay (*Garrulus glandarius*)
Jackdaw (*Corvus monedula*)
Rook (*C. frugilegus*)
Skylark (*Alauda arvensis*)
Swift (*Cypselus apus*)
Cuckoo (*Cuculus canorus*)
Ring-Dove (*Columba palumbus*)
Turtle-Dove (*Turtur communis*)
Pheasant (*Phasianus colchicus*)
Partridge (*Perdix cinerea*)
Moorhen (*Gallinula chloropus*)
Lapwing (*Vanellus vulgaris*)

Mr. A. E. Gibbs reports that comparatively few species of insects were seen on the wing, but that amongst the captures were some of considerable interest, including *Lobophora viretata*, now recorded for the second time in Hertfordshire, it having previously been taken at Haileybury by Mr. Bowyer; *Bapta bimaculata*; *Anaitis*

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plagiata; *Bupolus piniaria* flying round the fir-trees near the "Temple-of-Pan," one male being taken, and a female being seen, but being a high flyer not being captured; *Melanippe fluctuata*; *Asthena candidata*; a "pug" in poor condition, probably *Eupithecia abbreviata*; *Cilix glaucata*; one tortrix, *Sericoris lacunana*; and two Tineæ, *Nemaphora schwarziella* and one not identified. The great daddy-long-legs, *Tipula gigantea*, was seen flying near Grove Mill, but eluded capture.

The Grove Woods are strictly preserved, but no game was disturbed, the members being careful to respect the conditions under which Lord Clarendon always so freely grants permission for the Society to visit his estate.

Field Meeting, 15th June, 1901.

BUSHEY AND STANMORE COMMON.

The members, eighteen in number, under the direction of Mr. Hopkinson, first visited the Museum attached to the Schools of the Clergy Orphan Corporation, St. Margaret's, Bushey, by permission of the Head-mistress, Miss Baylee, who, with Miss Hibbert-Ware, the Science teacher, pointed out the chief objects of interest. There are numerous minerals and fossils, and botanical and zoological specimens. A series of coloured drawings of microscopic objects, well executed by the scholars, was examined with much interest, and coloured drawings of Mycetozoa, by Miss Hibbert-Ware, who has made a study of this interesting group of microscopic fungi, attracted special attention.

After visiting some other parts of the Schools and the prettily decorated Chapel, the party proceeded across Stanmore Common to Mrs Brightwen's residence, "The Grove." Some time was spent in wandering over the beautiful grounds, which Mrs. Brightwen endeavours to make a paradise for wild birds of all kinds, and the members were then shown by her some living foreign animals, including a colony of the Egyptian sacred beetles (*Scarabæus sacer*) engaged in forming the well-known globular pellets of excrement in which the eggs are laid. The beetle is about an inch long and black in colour, and the balls, which it forms by rolling the substance by means of its hind legs, are much larger than itself, sometimes, when completed, being an inch and a half in diameter.

Returning across the Common, the members had tea, on their way to Watford, at the Alpine Coffee Tavern.

Field Meeting, 22nd June, 1901.

GREAT GADDESDEN, NETTLEDEN, AND FRITHSDEN.

This meeting was under the direction of Mr. A. F. Crossman, who conducted a party of the members and their friends from Boxmoor to Great Gaddesden, Nettleden, and Frithsden, and thence across the Common to Berkhamsted.

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Great Gaddesden Church was first visited. It was built towards the close of the thirteenth century, and for many generations has been the burial-place of the Halsey family, a chapel for that purpose having been built on the north side of the chancel, about the year 1730, by Henshaw Halsey, Esq., nearly a century after the date of the earliest monument to any member of the family (1637). The oldest monument in the church is, however, of a much earlier date (1506), a brass on the floor, part only remaining, inscribed: "Hic jacent Will'm's Croke et Alicia filia Will'mi ffaryngton militis uxor dicti Will'mi qui quide' prefatus Will'm's Croke obiit xxix die me'sis Octobris, anno d'ni M° quingentesimo sexto."

Crossing the hill, Nettleden Church was visited for the first time by the Society since the parish of Nettleden was transferred from Buckinghamshire to Hertfordshire.

The "sunken way" to Frithsden was then taken by the walkers, while the cyclists went round by the foot of the hill, and on the hillside under Frithsden Copse a picnic tea was very kindly provided by Mrs. Crossman, of Berkhamsted.

Field Meeting, 6th July, 1901.

BERKHAMSTED.

The place of meeting was Berkhamsted Castle, and Mr. Edward Mawley, of Berkhamsted, acted as director. The party at this and also at the previous field meeting numbered about thirty.

After a stroll around the Castle grounds, Mr. Hopkinson gave a brief history of the stronghold. In the early British period its history is a matter of conjecture, although it is known that Berkhamsted was then a position of some importance; during the Roman occupation of Britain the Akeman Street passed through Berkhamsted; and to Saxon times the great mound, and probably the ditches, may be dated. The definite history of the Castle does not, he said, commence until the time of William the Conqueror, who occupied it after the battle of Hastings, and its history as a stronghold ends about the close of the fifteenth century, when it began to fall into decay.

Proceeding to the Common, a portion of the ancient British earthwork known as Grime's Dyke was inspected. Another portion of it can be seen on the opposite side of the valley, and a similar earthwork perhaps once continuous with it may be traced here and there across the country for many miles.

The principal object of the meeting was, however, the inspection of Mr. Mawley's meteorological observatory, which is one of the most complete in this country, and of his fine collection of roses. On arrival at Rosebank, Mr. and Mrs. Mawley hospitably entertained the party at tea, after which a tour of the garden was made, Mr. Mawley explaining the construction and use of several of his meteorological instruments, and Mrs. Mawley gathering for

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the ladies present as many roses as they could conveniently carry home, one of the prettiest of these being a variety named after their hostess, "Mrs. Edward Mawley."

222ND ORDINARY MEETING, 12TH NOVEMBER, 1901, AT WATFORD.

W. R. CARTER, B.A., in the Chair.

Mr. Ernest Crossland, B.Sc., "Waitangi," Marlborough Road, Watford; Mr. A. J. Nicholson, "Asphodel," St. Albans; and Mr. Aubrey C. Stawel-Stoyel, "The Briars," Watford, were proposed for membership of the Society.

The following lecture was delivered:—

"Amongst the Birds in Hertfordshire." By Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U.

Mr. Crossman explained certain habits and characteristics of a considerable number of birds, illustrating his remarks by many lantern-slides from photographs taken in the county. Altogether abouty fifty birds were dealt with, including both rare and common species. An account was given of the general distribution of the birds in the county, the features by which several closely allied species are distinguished were pointed out, and habits which are peculiar to certain birds were described. Some photographs showed birds sitting on their nests or hovering over them, and it was pointed out where the nests would most likely be found, specimens in various situations being shown on the screen. What the nests are made of, and how different species can be distinguished by the form of the nest, were explained and illustrated. One series of slides showed the action of the young cuckoo, which often, being reared by a hedge-sparrow or other bird in whose nest the cuckoo is in the habit of laying her eggs, ejects the young of the foster-parent, the various stages in the ejectment being clearly seen. Mr. Crossman mentioned, as an incident probably new to most of his audience, that a heron's nest had this year been found in the county, and young birds had been reared. He was not at liberty to divulge the name of the place, but he might say that it was not very far from Watford. Several slides were shown of interesting foreign birds which are being reared at Tring by the Hon. Walter Rothschild.

A discussion ensued, in which Mr. Bickerton, Mr. Daniel Hill, and Mr. Hopkinson took part.

223RD ORDINARY MEETING, 3RD DECEMBER, 1901, AT WATFORD.

SIR JOHN EVANS, K.C.B., D.C.L., LL.D., D.Sc., F.R.S., F.S.A., etc., in the Chair.

Mr. E. Crossland, B.Sc., Mr. A. J. Nicholson, and Mr. A. C. Stawel-Stoyel were elected Members of the Society.

Mr. A. Barton Kent exhibited and described a series of photographs illustrating "Egypt, Ancient and Modern," but was

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prevented from completing the series by the failure of the lantern-operator in manipulating the Society's oxy-hydrogen lantern.

Sir John Evans, who had recently returned from Egypt, then gave an interesting discourse on Egyptology.

224TH ORDINARY MEETING, 7TH JANUARY, 1902, AT WATFORD.

PROFESSOR JOHN ATTFIELD, M.A., Ph.D., F.R.S., F.I.C., Vice-President, in the Chair.

The following lecture was delivered :—

"A Journey through Iceland." By Arthur W. Hill, M.A., Fellow of King's College, Cambridge.

The lecture was illustrated by lantern-slides from photographs taken by the lecturer.

Mr. E. H. Jackson and Mr. W. Lepard Smith were appointed auditors of the accounts for the preceding year.

225TH ORDINARY MEETING, 16TH JANUARY, 1902, AT ST. ALBANS.

JOHN HOPKINSON, F.L.S., F.G.S., Assoc. Inst. C.E., in the Chair.

The following lecture was delivered :—

"Bird-Life in Hertfordshire." By Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U.

The lecture was illustrated by lantern-slides of birds and their nests from photographs taken in the county.

The Chairman stated that Mr. Crossman would shortly leave Hertfordshire for Western Australia, and alluded to the good work which he had done for the Society, chiefly by his annual reports as Recorder of Hertfordshire Birds, for which, and for his lecture that evening, he formally proposed that a vote of thanks be accorded to him. He very much regretted that Mr. Crossman was leaving this country, but wished him God-speed on his journey, and success in his new sphere of life—he might now say married life—and he hoped before many years were over to see him back again in England, not merely as a "summer migrant" or "winter visitant," but as a "permanent resident" amongst them. He also thanked Mr. Ashdown for providing and manipulating the oxy-hydrogen lantern, by means of which the lecture had been so successfully illustrated.

The vote of thanks was seconded by Dr. Morison and carried by acclamation.

27TH ANNIVERSARY MEETING, 4TH MARCH, 1902.
(AT WATFORD.)

LEWIS EVANS, F.S.A., F.R.A.S., President, in the Chair.

The Report of the Council for the year 1901, and the Treasurer's Account of Income and Expenditure, were read and adopted.

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William Marriott, F.R. Met. Soc., Assistant Secretary of the Royal Meteorological Society, "Ben Nevis," Thornlaw Road, West Norwood, was elected a Corresponding Member of the Society.

The President delivered an address entitled "Progress during the Nineteenth Century." (*Transactions*, Vol. XI, pp. 105–118.)

The following gentlemen were duly elected as the Officers and Council for the ensuing year:—

President.—Lewis Evans, F.S.A., F.R.A.S.

Vice-Presidents.—Professor John Attfield, M.A., Ph.D., F.R.S., F.I.C.; Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U.; Sir John Evans, K.C.B., D.C.L., LL.D., Sc.D., F.R.S., V.P.S.A., etc.; the Right Honourable the Earl of Verulam.

Treasurer.—John Weall.

Honorary Secretaries.—A. E. Gibbs, F.L.S., F.R.H.S.; T. E. Lones, M.A., LL.D., B.Sc.

Editor.—John Hopkinson, F.L.S., F.G.S., F.R.M.S., F.R. Met. Soc., Assoc. Inst. C. E.

Librarian.—Daniel Hill, F.R.H.S.

Other Members.—William Bickerton; E. T. Burr; W. R. Carter, B.A.; Arthur E. Ekins, F.C.S., F.I.C.; W. Gruggen, L.R.C.P.E.; George P. Neele; A. Lestock Reid, M.D.; James K. Riggall; George Rooper, F.Z.S.; W. Lepard Smith; William Whitaker, B.A., F.R.S., F.G.S., Assoc. Inst. C.E.; E. T. Wilks, F.R.G.S.

The thanks of the Society were accorded to Mr. William Whitaker, F.R.S., retiring from the office of Vice-President; and to Mr. E. M. Chater, Mr. Alfred E. Cox, M.R.C.S., Mr. F. W. Silvester, and Mr. G. H. Wailes, retiring from the Council.

Report of the Council for the Year 1901.

The Council of the Hertfordshire Natural History Society, in presenting the 27th Annual Report, regrets to announce that there has again been a falling-off in the number of members. During the year seven ordinary members have been elected; fourteen members have resigned; and the Council regrets to have to record the loss by death of one Honorary Member, Miss Eleanor A. Ormerod, LL.D., F.R. Met. Soc., F.E.S., and one Ordinary Member, Sir Joseph Henry Gilbert, Ph.D., LL.D., F.R.S., etc.

Miss Eleanor A. Ormerod was the youngest daughter of George Ormerod, the well-known author of the 'History of Cheshire,' and was born on 11th May, 1828. For many years she was a Fellow of the Royal Meteorological Society and of the Entomological Society, and in the year 1900 the honorary degree of LL.D. was conferred upon her by the University of Edinburgh. Miss Ormerod was an entomologist of much repute, and devoted most of her time to the investigation of insects which are in a special degree injurious to crops. The results of her work, chiefly to be found in her twenty-four 'Annual Reports of Observations

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of Injurious Insects,' have been of considerable value to agriculturists. Miss Ormerod contributed several papers and notes to the 'Transactions' of this Society, of which she was elected an Honorary Member in the year 1881. Her death took place on Friday, 19th July, 1901, at her residence at St. Albans.

Sir Henry Gilbert was born at Hull in the year 1817, and was educated at Glasgow University, University College, London, and Giessen University, where he graduated as Ph.D. He assumed control of the chemical laboratory at the Rothamsted Experimental Station, Harpenden, where he assisted Mr. (afterwards Sir) John Bennet Lawes in carrying out a valuable series of experiments, chiefly on the effects of various fertilizers upon the growth of plants. The results of these experiments were published chiefly in the well-known reports on the 'Field and other Experiments conducted on the Farm and in the Laboratory at Rothamsted,' which have been of great value to farmers and stock-breeders. Honorary degrees were conferred upon Sir Henry Gilbert by the Universities of Oxford, Cambridge, Edinburgh, and Glasgow, and for forty years he was a Fellow of the Royal Society. He died at Harpenden on Monday, 23rd December, 1901, at the advanced age of 84 years. He was a member of the Hertfordshire Natural History Society for 22 years.

The census of the Society at the end of the years 1900 and 1901 was as follows:—

	1900.	1901.
Honorary Members	15	14
Corresponding Members	3	3
Life Members	44	44
Annual Subscribers	120	115
	182	176

The following papers or lectures have been read or delivered at Watford during the year:—

Jan. 22.—Haunts and Habits of British Birds; by Richard Kearton, F.Z.S.
March 26.—Report on the Conference of Delegates to the British Association at Bradford in 1900; by John Hopkinson, F.L.S., F.G.S.
—— Notes on Lepidoptera observed in Hertfordshire in the Year 1900; by A. E. Gibbs, F.L.S., F.R.H.S.
—— Note on the appearance of a Foreign Beetle (*Diaxenes dendrobii*) at Watford; by A. C. Stawel-Stoyel.
—— Notes on Birds observed in Hertfordshire during the Year 1900; by Alan F. Crossman, F.L.S., F.Z.S.
April 23.—Introductory Remarks to a List of Works on the Geology of Hertfordshire; by John Hopkinson, F.L.S., F.G.S.
—— Ostracoda from the Chara-Marl of Hitchin; by Frederick Chapman, A.L.S., F.R.M.S.
—— Further Note on the Palæolithic Deposits at Hitchin; by Clement Reid, F.R.S., F.L.S., F.G.S.
—— Report on Phenological Phenomena observed in Hertfordshire during the Year 1900; by Edward Mawley, Sec.R.Met.Soc.
—— List of the Lepidoptera of Cheshunt and its Neighbourhood; by W. C. Boyd.
Nov. 12.—Amongst the Birds in Hertfordshire; by Alan F. Crossman, F.L.S., F.Z.S.
Dec. 3.—Egypt, Ancient and Modern; by A. Barton Kent.

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The following Field Meetings were held during the year:—

May 11.—Tring Museum and Tring Park.
—— 25.—Ayot Green and Brocket Park.
June 1.—The Grove, Watford.
—— 15.—Bushey and Stanmore Common.
—— 22.—Great Gaddesden, Nettleden, and Frithsden.
July 6.—Berkhamsted.

These Field Meetings were very well attended, the average number of members and their friends present being about 26.

The meeting on May 25th was held in conjunction with the St. Albans Photographic Society.

The Society is indebted to the Hon. Walter Rothschild for permission to visit his Zoological Museum at Tring on Saturday, May 11th, and to Mr. E. Hartert and Dr. K. Jordan for showing the members over the Museum; to Lord Rothschild for permission to visit Tring Park; to the Right Hon. the Earl of Clarendon for permission to visit his private grounds and woods at The Grove; to Miss Baylee for permission to inspect the Museum at St. Margaret's, Bushey, and Miss Hibbert-Ware for conducting the members through the Museum; and to Mrs. Brightwen for permission to visit her private grounds at The Grove, Stanmore Common. The Society is also indebted to the kind hospitality of Mrs. Hopkinson, Mrs. Crossman, and Mrs. Mawley at the field meetings at The Grove, Watford, Frithsden, and Berkhamsted.

It is with great regret that the Council has to report the loss of the services of Mr. Alan F. Crossman, who has done excellent work for several years as Recorder of Birds for the county. Mr. Crossman resigned in consequence of his leaving England for Western Australia.

The tenth volume of the present series of the Society's 'Transactions' has been completed and the eleventh volume has been commenced, three parts of the former, containing 92 pages, and two of the latter, containing 64 pages and 6 plates, having been published during the year. All the papers in the tenth volume record the results of local investigation. The Meteorology and Phenology of Hertfordshire are discussed in ten papers, nine being the usual annual reports on the meteorology, rainfall, and phenology of the county, and one recording some effects of a severe hailstorm; to the Geology six papers are devoted, three being Presidential Addresses, one, partly meteorological, treating of the Chadwell Spring and Hertfordshire Bourne, and two treating of superficial deposits (the Hitchin Lake-bed and the Gravels, etc., of West Herts); to the Botany of Herts, Beds, and Bucks there are three contributions (two on the Mycetozoa and one on Parasitic Flowering Plants); in Entomology there is a report on the Lepidoptera of West Herts and a note on the observation of Leaf-cutting Bees at Watford; Ornithology is represented by a list of the Birds of Hertfordshire and three annual reports on birds observed in the county; and finally, Topography has received attention, for the first time for several years, in a paper on the

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INCOME AND EXPENDITURE FOR THE YEAR 1901.

Dr.	£	s.	d.	Cr.	£	s.	d.
To Balance from 1900	17	18	9	By Printing 'Transactions'	55	4	5
,, Entrance Fees	3	0	0	,, Miscellaneous Printing	4	14	6
,, Subscriptions for 1898	1	0	0	,, Expenses of Meetings	5	6	6
,, ,, ,, 1899	2	0	0	,, Library Expenses	10	4	1
,, ,, ,, 1900	4	10	0	,, Salary of Assistant	5	0	0
,, ,, ,, 1901	47	10	0	,, Postages and Carriage of Parcels	13	6	1
,, ,, ,, 1902	6	10	0	,, Fire Insurance Premium	0	12	6
,, Dividends on £130 India 3 per cent. Stock	3	18	0	,, Herts County Museum Print Fund	2	2	0
,, Sale of 'Transactions'	0	17	4	,, Cheque Book, with Special Printing	0	5	11
,, Balance, being amount overdrawn	9	11	11				
	£96	16	0		£96	16	0

Amount invested in the purchase of £130 India 3 per cent. Stock . . . . £126 15*s.* 6*d.*

Audited and found correct this 28th day of February, 1902, { E. H. JACKSON, ALFRED E. COX.

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Place-names and Field-names of Watford parish. There are also several local meteorological, botanical, and zoological notes. In the 'Proceedings' are reports of the Conferences of Delegates to the British Association at Toronto in 1897, Bristol in 1898, and Dover in 1899, in which local scientific work that may be done by the Society is pointed out. The volume is illustrated by three plates and ten geological sections.

Very few donations to the Library have been received, but about the usual number of exchanges. The Library has been open every Thursday evening during the Winter months, the average attendance being about two.

The Council desires to express the great indebtedness of the Society to the Watford Urban District Council for permitting the evening meetings being held in the Council Chamber, Upton House.

Additions to the Library in 1901.

Presented.

British Association for the Advancement of Science. Report for 1900 (Bradford). 8vo. London, 1901 .	*The Association.*
Evans, Sir John. Numismatic Society. Anniversary Address. 8vo. London, 1901	*The Author.*
———. The First Gold Coins of England . . .	,,
Symons' Monthly Meteorological Magazine. Vol. xxxvi. 8vo. London, 1901	*Dr. H. R. Mill.*
Whitaker, W. Guide to the Geology of London. 6th ed. 8vo. London, 1901	*The Author.*

Received in Exchange.

American Academy of Arts and Letters. Transactions. Vol. xii, part 2; vol. xiii, part 1. 8vo. Madison, 1900-1901.

American Monthly Microscopical Journal, 1900–1901. 8vo. New York, 1900–1901.

American Museum of Natural History. Report for the Year 1900. 8vo. New York, 1901.

———. Bulletin. Vol. xiii. *Ib.*

Bath Natural History and Antiquarian Field Club. Proceedings. Vol. ix, part 4. 8vo. Bath, 1901.

Boston Society of Natural History. Proceedings. Vol. xxix. 8vo. Boston, Mass., 1900.

Bristol Naturalists' Society. Proceedings. Vol. ix, part 2. N.S. 8vo. Bristol, 1901.

Cardiff Naturalists' Society. Report and Transactions. Vol. xxxii. 8vo. Cardiff, 1901.

Croydon Natural History and Microscopical Club. Proceedings, 1900–1901. 8vo. Croydon, 1901.

Edinburgh. Botanical Society. Transactions and Proceedings. Vol. xx, parts 2, 3. 8vo. Edinburgh, 1895–96.

———. Royal Physical Society. Proceedings. Session 1899–1900. 8vo. Edinburgh, 1901.

Glasgow Natural History Society. Transactions. Vol. vi, part 1. 8vo. Glasgow, 1901.

———, Philosophical Society of. Proceedings. Vol. xxxii. 8vo. Glasgow, 1901.

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Liverpool Geological Society. Proceedings. Vol. viii, part 4. 8vo. Liverpool, 1900.

London, Geological Society of. Abstracts of the Proceedings. Session 1900–1901. 8vo. London, 1901.

———. Geologists' Association. Proceedings. Vol. xvi, parts 6, 9, 10; vol. xvii, parts 1–5. 8vo. London, 1900–1901.

———. Queekett Microscopical Club. Journal. Vol. viii, Nos. 48, 49. 8vo. London, 1901.

———. Royal Meteorological Society. Quarterly Journal. Vol. xxvii. 8vo. London, 1901. Index to vols. viii-xxvi. *Ib.*

———. ———. Meteorological Record. Vols. xix-xxi. *Ib.* 1899–1901.

———. Royal Microscopical Society. Journal, 1901. 8vo. London, 1901.

Manchester Field Naturalists' and Archæologists' Society. Report and Proceedings for 1900. 8vo. Manchester, 1901.

——— Geographical Society. Journal. Vol. xiv, Nos. 9–12 and Supplement; vol. xvi, Nos. 4–12; vol. xvii, Nos. 1–6. 8vo. Manchester, 1899–1901.

——— Geological Society. Transactions. Vol. xxvi, parts 10–19; vol. xxvii, parts 1–7. 8vo. Manchester, 1900–1901.

——— Literary and Philosophical Society. Memoirs and Proceedings. Vol. xliv, part 2. 8vo. Manchester, 1901.

Mexico, Instituto Geologico de. Boletin. Num. 14.—Les Rhyolites de Mexico. Fo. Mexico, 1900.

New York Academy of Sciences. Annals. Vol. xiii, parts 1–3. 8vo. Lancaster, Pa., N.D.

———. Memoirs. Vol. ii, part 3.—Palæontological Notes, by B. Dean. 8vo. New York, 1900.

New York State Museum. Bulletins. Vol. iv, No. 19.—Guide to the Geological Collections in the Museum. 8vo. Albany, 1898. Vol. v, No. 20. –The Elm-leaf Beetle, by E. P. Felt; No. 21.—Geology of Lake Placis Region, by J. F. Kemp; No. 22.—Earthenware of the New York Aborigines, by W. M. Beauchamp; No. 23.—Report on Injurious Insects, by E. P. Felt. *Ib.* Vol. v, No. 25.—Report of the State Botanist for 1898, by C. H. Peck; No. 26.—Collection, Preservation, and Distribution of New York Insects, by E. P. Felt; No. 27.—Shade-tree Pests in New York State, by E. P. Felt. *Ib.* 1899. Vol. vi, No. 28.—Plants of North Elba, by C. H. Peck; No. 29.—Preliminary List of New York Mammals, by G. S. Miller; No. 30.—Petrolium and Natural Gas, by E. Orton. *Ib.* Vol. vii, No. 32.—Aboriginal Occupation of New York, by S. T. D. Beauchamp. *Ib.* 1900.

———. 49th Annual Report, for 1895. Vol. iii. 8vo. Albany, N.Y., 1898. 50th Annual Report, for 1896. Vol. ii. *Ib.* 1899. 51st Annual Report, for 1897. 2 vols. *Ib.*

Norfolk and Norwich Naturalists' Society. Transactions. Vol. vii, part 2. 8vo. Norwich, 1901.

Northamptonshire Natural History Society. Journal. Vol. x, Nos. 81–84. 8vo. Northampton, 1901.

Philadelphia Academy of Natural Sciences. Proceedings. Vol. lii, parts 1, 3; vol. liii, part 2. 8vo. Philadelphia, 1901.

Rochester Academy of Sciences. Proceedings. Vol. iii, brochure 2. 8vo. Rochester, N.Y., 1900.

Somersetshire Archæological and Natural History Society. Proceedings. Vol. vi. 8vo. Taunton, 1900.

United States Department of Agriculture. Division of Biological Survey. North American Fauna. No. 16.—Shasta County, California. No. 20.—Revision of Chinca Skunks. No. 21 —Natural History of Queen Charlotte's Island, B.C., and Cook Inlet, Alaska. 8vo. Washington, 1900.

———. Cape Nome Gold Region, Alaska, by F. Schroder and A. H. Brooks. *Ib*

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UNITED STATES GEOLOGICAL SURVEY. 20th Annual Report, for 1898-99. Part 2.—General Geology and Palæontology. Part 3.—Precious Metal Mining Districts. Part 4.—Hydrography. Part 5.—Forest Reserves, with case of eight Maps. Part 7.—Explorations in Alaska in 1898. 4to. Washington, 1900.

———. 21st Annual Report, for 1899–1900. Part 1.—Director's Report. 4to. Washington, 1900. Part vi. — Mineral Resources; Metallic Substances. Part vi (continued).—Mineral Resources; Non-Metallic Substances. *Ib.* 1901.

———. Bulletins. No. 163.—Flora of the Montana Formation; by F. H. Knowlton. No. 164.—Rio Grande Coal Fields; by Vaughan. No. 165.—Geology of Maine; by Gregory and Williams. No. 166 —Gazetteer of Utah; by H. Gannett. No. 167. — Contributions to Chemistry and Mineralogy; by Clark. No. 168.—Analyses of Rocks; by Clark. No. 169.—Altitudes in Alaska; by H. Gannett. No. 170.—Survey of the Boundary Line between Idaho and Montana; by Goode. No. 171.—Boundaries of the United States and Territories; by H. Gannett. No. 172.—Bibliography and Index of North American Geology, etc., for 1889; by F. B. Weeks. No. 173.—Synopsis of American Fossil Bryozoa; by Nickels and Bassler. No. 174.—Survey of N.W. Boundary Line of the United States, 1857–61; by Baker. No. 175.—Triangulation and Spirit-levelling in Indian Territory; by Fitch. No. 176.—Some Principles and Methods of Rock Analysis; by Hillebrand. 8vo. Washington, 1900.

———. Monographs. Vol. xxxix.—The Eocene and Lower Oligocene Coral Faunas; by J. W. Vaughan. 4to. Washington, 1900. Vol. xl.—Adiphagous and Clavicorn Coleoptera from the Tertiary Deposits at Florissant, Colorado, etc.; by S. H. Scudder. *Ib.*

UPSALA, UNIVERSITY OF. Bulletin of the Geological Society. Vol. v, part 1. 8vo. Upsala.

WILTSHIRE ARCHÆOLOGICAL AND NATURAL HISTORY SOCIETY. Magazine. Vol. xxxi, Nos. 94, 95. 8vo. Devizes.

———. Inquisitiones Post Mortem. Abstracts. Charles I. Part 8. *Ib.*

YORKSHIRE GEOLOGICAL AND POLYTECHNIC SOCIETY. Transactions. Vol. xiv, part 2. 8vo.

——— NATURALISTS' UNION. Transactions. Parts 23-26. 8vo. Leeds, 1897–1900.

——— ———. Naturalist. N.S. Vol. xxvi. 8vo. Leeds, 1901.

PURCHASED.

BOTANY, JOURNAL OF. Vol. xxxix. 8vo. London, 1901.

BUCKLER, W. (the late). Larvæ of the British Butterflies and Moths. Vol. ix. Ed. by G. T. Porritt. (*Ray Society.*) 8vo. London, 1901.

NATURE NOTES. Vol. xii. (*Selborne Society.*) 8vo. London, 1901.

NEWSTEAD, R. Coccidæ of the British Isles. Vol. i. (*Ray Society.*) 8vo. London, 1901.

NOVITATES ZOOLOGICÆ. Vol. viii. 8vo. Tring, 1901.

YEAR-BOOK of the Scientific and Learned Societies of Great Britain and Ireland. . . . 1900. 8vo. London, 1901.

ZOOLOGIST. 4th Series. Vol. v. 8vo. London, 1901.

226TH ORDINARY MEETING, 5TH MARCH, 1902, AT ST. ALBANS.

DR. JOHN MORISON, F.G.S., in the Chair.

The following lecture was delivered:—

"The Story of the Earth." By James Saunders, A.L.S.

The lecture was illustrated by means of the oxy-hydrogen lantern, kindly provided and manipulated by Mr. C. H. Ashdown.

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227TH ORDINARY MEETING, 25TH MARCH, 1902, AT WATFORD.

GEORGE P. NEELE in the Chair.

The following papers were read:—

1. "The Climate of Hertfordshire, deduced from Meteorological Observations taken during the Twelve Years 1887–1898." By John Hopkinson, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C. E. (*Transactions*, Vol. XI, pp. 121–134.)

2. "Report on Phenological Phenomena observed in Hertfordshire during the Year 1901." By Edward Mawley, Vice-Pres.R.Met.Soc., F.R.H.S. (*Transactions*, Vol. XI, pp. 135–141.)

3. "Notes on Lepidoptera observed in Hertfordshire in the Year 1901." By A. E. Gibbs, F.L.S., F.R.H.S. (*Transactions*, Vol. XI, pp. 165–172.)

4. "Notes on the Fish of the Upper Lea." By James Saunders, A.L.S. (*Transactions*, Vol. XI, pp. 119–120.)

5. "Notes on Birds observed in Hertfordshire during the Year 1901." By William Bickerton. (*Transactions*, Vol. XI, pp. 142–144.)

6. "REPORT ON THE CONFERENCE OF DELEGATES TO THE BRITISH ASSOCIATION AT GLASGOW IN 1901." By JOHN HOPKINSON, F.L.S., F.G.S., Assoc. Inst. C. E.

The meetings of the Conference were held on the 12th and 17th of September. Of the five members of the Corresponding Societies' Committee who were present, two are members of our Society; the Chairman of the Conference, Mr. F. W. Rudler, F.G.S., being a Corresponding Member, and the Vice-Chairman, Mr. W. Whitaker, F.R.S., being an Honorary Member and a past President, and also the Society's Delegate to this Conference.

FIRST MEETING.

The Report of the Corresponding Societies' Committee commenced with the statement that the only Society which complied with its request to suggest a subject for discussion at this Conference was the Hertfordshire Natural History Society, the subject being "The desirability of County Photographic Surveys." As, however, your recorder of this Conference, who suggested this subject on behalf of his Society, was unable to be present, it was postponed, and a suggestion of the Rev. J. O. Bevan, mentioned at the end of the report on the previous Conference, was adopted.

The question of copyright was mentioned, it being stated that the officers of the Association had been authorized to co-operate with other Societies if a Bill relating to it were again brought before Parliament, the Bill to which reference was made in the previous Report having lapsed.

In the course of his opening Address the Chairman referred to the registration of type-specimens as a work which the local

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Societies might readily and usefully undertake, not only with regard to fossils, but also in all departments of natural history.

How the steady growth of scientific education in this country during recent years has told most favourably upon the character of our local Societies was then pointed out, a review of the proceedings of the various local Societies at the present day showing that a high standard of excellence is often attained.

Turning to his own special subject, geology, Mr. Rudler drew attention to the importance to each Society of the study of the physiographic features of its district, a branch of enquiry which is now known as geomorphology, and he recommended the working-out of river-development—of the reason why each stream flows in one direction rather than in another, how it has flowed in the past, and how it may possibly flow in the future. "In the modern view of river-development, largely due to American geologists," he said, "the stream is regarded as working its way downwards, cutting its channel deeper and deeper, until it eventually reaches what Major Powell has called its 'base-level.' Then ceasing to work in this way, it meanders sluggishly over its plain, when a period of rejuvenescence sets in, and a new cycle of erosive activity is initiated." And he thus compared the life of a scientific Society with that of a river: "In a somewhat similar manner it may happen that a local Society, which in its youth was vigorous as a mountain-stream, gradually finds its energy on the wane, and may at length reach a base-level of existence, when it flows placidly along, like the river in its lower reaches, very beautiful, and no doubt useful in its way, yet decidedly sluggish."

Of the two pieces of systematic work here recommended to be undertaken, that of river-development appeals strongly to us. It is, as Mr. Rudler stated, a fascinating subject, and it is one which might well be studied in our county. There is less scope for the registration of type-specimens, which I may mention are the original specimens from the examination of which figures and descriptions of new species have been produced. I doubt whether we have any in our County Museum. A list of the local fossils in the Museum might, however, be published by the Society, to the past history and present state of which, I fear, Mr. Rudler's simile well applies, although I hope that the period of rejuvenescence is about to set in.

After a discussion on the advisability of the Corresponding Societies' Committee stating each year what has been the outcome of the Conference of Delegates held in the preceding year, the Rev. J. O. Bevan brought his subject, already mentioned, forward.

"For some time past," he said, "the Delegates have been enquiring at the annual meetings: 'What can we do—what can our Society do—to further the ends of science through the Association?'" He then proceeded to answer this question to a certain extent, dwelling on the importance of investigations being carried on uniformly so as to admit of easy comparison over wide areas. "In the choice of subjects," he said, "three considerations (at

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least) present themselves :—(*a*) They should be of a general kind, capable of being worked up by the local Societies in their respective districts. (*b*) A preliminary arrangement should be arrived at whereby may be determined the lines and limits of investigation, the mode of tabulation of results, the scale of chart or map, the scheme of symbolical representation, coloration, nomenclature, conventional arrangement of detail, the method, form, size of publication, and the like. (*c*) A special Society or expert should be indicated as ready to advise in regard to each of the particular subjects."

"The ends to be gained," Mr. Bevan stated to be (amongst others): "The taking stock of all facts by a connected series of methodical surveys," and "the setting forth of results in a manner directly susceptible of useful comparison"; and, after enumerating a number of subjects for investigation and forestalling certain objections, he moved the following resolution :—"That the Committees of the Corresponding Societies be invited to lay before their members the necessity of carrying on a systematic survey of their counties or districts in respect of ethnography, ethnology, botany, meteorology, ornithology, archæology, folklore, etc."

A long discussion ensued, resulting in an amendment being put and carried that a Committee be appointed to consider the subject and report to the next meeting of the Conference.

A question as to the lapsed Copyright Bill was put and answered by the Chairman to the effect that the matter may be safely left in the hands of the Council of the Association.

Second Meeting.

The following resolution was moved by Captain Dubois Phillips, and carried :—"That the Corresponding Societies' Committee be requested in future to bring before the Conference of Delegates some account of the outcome of the Conference of the preceding year."

The Committee appointed to consider the suggestions of the Rev. J. O. Bevan reported, recommending for adoption the following subjects and referees for them :—

Registration of Type-Specimens.—Dr. A. Smith Woodward.
Coast Erosion.—Mr. W. Whitaker.
Record of Boreholes, Wells, and Sections.—North of England Institute of Mining and Mechanical Engineers, and Professor J. H. Merivale.
Tracing the Course of Underground Water.—Yorkshire Geological and Polytechnic Society, and Mr. A. R. Dwerryhouse.
Erratic Blocks.—Yorkshire Naturalists' Union, and Professor P. F. Kendall.
Geological Photographs.—Belfast Naturalists' Field Club, and Professor W. W. Watts.
Underground Fauna.—Rev. T. R. R. Stebbing.
Variations in the Course of Rivers and Shape of Lakes.—Dr. H. R. Mill.
Archæological Survey by Counties.—Woolhope Naturalists' Field Club, and the Rev. J. O. Bevan.
Ethnographical Survey.—Anthropological Institute.
Botanical Survey by Counties.—Mr. W. G. Smith.
Photographic Record of Plants.—Mr. A. K. Coomáraswámy.

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For bringing the question of systematic work before the Conference of Delegates the thanks of all provincial Societies which are not doing good local work for want of knowing what to do and how to do it, are due to Mr. Bevan, but it is evident that the exact terms of his resolution could not have been adopted. No reason was given by him for the exclusion of geology, nor why the only department of zoology taken up should be ornithology. "The proper study of mankind" occupies somewhat anomalous positions, coming both first and last, and the position of meteorology between two biological sciences is curious. A consecutive arrangement of subjects for research is, however, almost impossible, but I would suggest the following as a convenient sequence: meteorology, geology, botany, zoology, anthropology, the last to include the first two and the last two of Mr. Bevan's subjects, or the study of man and his works from the earliest times to the present day. The complete local elucidation of these departments of natural science should be the end and aim of all provincial Natural History Societies, while special attention may for the present be given to the subjects recommended by the Committee and endorsed by the Delegates at this meeting. It is not, of course, every Society which can undertake them all, the subject of coast-erosion, for instance, being outside the province of an inland Society such as ours. Again, some of these subjects have already been worked out for Hertfordshire, an archæological survey having been compiled by Sir John Evans and published by the Society of Antiquaries, and our Society having published a very complete Flora of the County, the Cryptogamic portion of which is being more thoroughly worked up by several of our members. Records of wells and boreholes in Hertfordshire should be communicated to Mr. Whitaker, although it is doubtful whether any will escape his vigilance. In "tracing the course of underground water" there is a fine field open in Hertfordshire. It would be a splendid piece of work to determine the course of the water which sinks into the Chalk from our swallow-holes, and conversely to determine whence comes the water which rises in our most notable springs.

What is really required is the systematic local study of Nature, from physical phenomena and the simple elements up to the most complex and marvellous of the works of the Creator.

The rest of the Conference was devoted to the consideration of special departments of research brought forward by Delegates from the various Sectional Committees of the Association. Of these the following are all which are of interest to us. In Geology, erratic blocks, the movement of underground waters, and geological photographs, of which the Geological Photographs Committee has only 10 from Hertfordshire, while it has 446 from Yorkshire. In Botany, botanical photographs, a Committee of the Association having been appointed to consider the desirability of collecting, preserving, and systematically registering photographs of botanical interest. And in Anthropology, the collection of anthropological photographs, and the "very great desirability of systematically collecting and

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recording instances of primitive customs, industries, appliances, and so forth." As to this Mr. Henry Balfour made the following (amongst other) very pertinent remarks :—"No one can have a higher admiration for the very noble institution known as the British Museum than I have, but at the same time I have a sort of uneasy feeling that it is representative of almost everything except British archæology and ethnology; and one object in raising this matter to-day is to suggest that this systematic collection of all such things as I have referred to should be made with a view to establishing some day a museum which will adequately represent the past history of our own country, not only the prehistoric period, but also the later mediæval and peasant life of the country, which has not received sufficient attention so far." That which is here recommended for the whole country might well be attempted for Hertfordshire in our County Museum.

Field Meeting, 26th April, 1902.

KEW GARDENS.

A party of some five-and-twenty members and friends assembled at the principal entrance to the Gardens on Kew Green, some cycling from Watford, whilst the majority arrived by train. The meeting was under the direction of the Librarian, Mr. Daniel Hill, F.R.H.S., who has furnished the following account of it :—

The "Wild Garden" was first visited, where narcissi, tulips, crocuses, and other bulbous plants were seen growing naturally in the grass. This style of gardening might well be adopted more generally, for in many gardens there are grass borders, pieces of lawn, or orchards, which could be made beautiful for at least three months in the year by judicious planting of bulbs, etc., which die down before the grass requires cutting for hay.

The "Rock Garden" was next visited, where various members of the saxifrage and hardy primula family were in full flower. The Temperate and Tropical Fern Houses were then walked through, and also the Succulent House, in which a fine *Protea* was in full flower. This singular Cape plant has hard rigid leaves up the stems, with a flower at the top much resembling a large sunflower, though belonging to an entirely different natural order. Many beautiful hardy and half-hardy annuals and biennials were seen in flower in the "Greenhouse," a fine show being made with the new varieties of *Schizanthus*, *Cineraria cruenta* hybrids, and *Campanula*.

The bed in the tank in the *Victoria regia* House had just been made up ready to receive the seedling plant, and it was noticed that the plant of *Lodoicea seychellensis* had been moved to the other side of the house, as it had grown quite up to the glass in its former place. In the Palm House a banana was pointed out in flower, and also *Strelitzia angustifolia*, belonging to the same natural order (Musaceæ). It has a very curious blossom somewhat

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resembling the crest of an angry macaw. In the Temperate House many beautiful Himalayan rhododendrons and also camellias were seen in flower.

Time only permitted a glance at the paintings in the "North" picture-gallery, made by the late Miss M. North to illustrate the vegetation of all parts of the world as actually seen by her, and presented by her to the Nation.

Tea was partaken of in the Gardens, and on the way back to the principal entrance the grand hillock of *Narcissi* near the water-tower attracted attention and was much admired.

Field Meeting, 3rd May, 1902.

WATFORD, OXHEY, AND HARROW WEALD.

Assembling at Bushey Station, the members first examined an alluvial deposit recently exposed in making an excavation for a new gasometer at the Watford Gas Works, close to the River Colne. As a description of the section by Dr. Lones will appear in our 'Transactions,' it will suffice to say here that it is chiefly of interest from the large number of land and fresh-water Mollusca which occur in a bed of grey clay, the alluvium of the Colne in Holocene times, which is overlain by a bed of brown clay, black and peaty at the base, and underlain by a bed of coarse flint-gravel and sand reposing on the eroded surface of the Chalk.

The following is a list of the Mollusca which were collected by the present writer at the time and on a subsequent visit:—

Helix rotundata, *Mull.*
,, nemoralis, *L.*
,, hortensis, *Mull.*
,, arbustorum, *L.*
,, caperata, *Mont.*
Pupa muscorum (*L.*)
Cochlicopa lubrica (*Mull.*)
Succinea putris (*L.*)
Planorbis spirorbis, *Mull.*
Planorbis vortex (*L.*)
,, carinatus, *Mull.*
,, contortus (*L.*)
Physa fontinalis (*L.*)
Limnæa peregra (*Mull.*)
,, palustris (*Mull.*)
Bythinia tentaculata (*L.*)
Pisidium amnicum (*Mull.*)
,, fontinale (*Drap.*)

These species are all living in Hertfordshire at the present day. The majority, it will be noticed, are fresh-water forms, and individually they are by far the most numerous, chiefly owing to the abundance of *Planorbis spirorbis* and *Bythinia tentaculata.* All the specimens of *Limnæa peregra* which were seen appeared to be of the variety *ovata.*

Oxhey Chapel was then visited, Mr. R. M. Finley pointing out its chief features of interest. It is nearly covered with ivy, and close to it at its east end are three Scotch firs. There are a few monuments in the chapel, and on a tablet of alabaster it is stated that the chapel was built in the year 1612; but it was then really rebuilt on the site of an older structure. The farmhouse, known as Oxhey Place, was also visited. According to Cussans,* this is

* 'History of Hertfordshire,' Cashio Hundred, p. 175.

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not the original Oxhey Place; the old house, he says, "stood between the farm and the chapel."

Permission to ramble in Oxhey Woods had been kindly granted by Mr. T. F. Blackwell, but so much time had been devoted to geology and archæology that both cyclists and pedestrians hurried through the woods, keeping to the main road, into Little Oxhey Lane; and, after a brief inspection of Grime's Dyke, had tea in the garden of "The Case is Altered," at "The City," Harrow Weald, whence a fine view in the direction of London was obtained, Harrow-on-the-Hill, which is situated on an outlier of the Bagshot Sand, being its chief feature.

Field Meeting, 24th May, 1902.

HAREFIELD.

This meeting was arranged to take place under the direction of the Secretary, Dr. Lones, but as the only other member of the Society present was the Editor, it was abandoned after the Reading Beds and gravel on Woodcock Hill had been examined.

Field Meeting, 5th July, 1902.

AYOT AND WELWYN.

This meeting was held in conjunction with the Geologists' Association, and was under the direction of Mr. Hopkinson and Mr. A. E. Salter. The following is Mr. Salter's report of it, with the omission of a few words here and there:—*

Having arrived at Ayot Station, the sections in the brickyard close by were examined. Mr. Hopkinson described the Reading Beds, which are here false-bedded, and also show contortions due to the dissolution of the Chalk which lies immediately below. The London Clay was not well shown, but good sections of drift-gravel and clay above the Tertiaries gave scope for an animated discussion. Blocks of Hertfordshire conglomerate, quartz, etc., were seen on the floor of the pit. The drift clay seemed to be made up of disturbed London Clay, in which local material from the subjacent gravels and Chalk were mixed. *Gryphæa dilatata* was obtained from the upper portion.

A walk then followed to Welwyn, where tea was procured at the White Hart Hotel, after which two sections of gravel in the Mimram valley were examined, and the great difference in the character of its constituents from that of the gravel previously seen at Ayot was pointed out.

Pebbles of various igneous rocks were readily found, having probably been washed out of boulder-clay farther up the valley.

Mr. Salter had previously found a Palæolithic implement in one of the pits, but not one was obtained on this occasion.

* From 'Proc. Geol. Assoc.,' vol. xvii, p. 396.

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The viaduct of the Great Northern Railway at Digswell was pointed out as showing to what extent the valley of the Mimram had been excavated in comparatively recent times.

A hearty vote of thanks to the Directors brought an interesting excursion to a close.

228TH ORDINARY MEETING, 4TH NOVEMBER, 1902, AT WATFORD.

GEORGE P. NEELE in the Chair.

Mr. Arthur Cottam, F.R.A.S., "Eldercroft," Watford; Mr. Henry John Bliss, "Biskra," Watford; and Mr. E. Montague Jones, B.A., Head Master of the Grammar School, St. Albans, were proposed for membership of the Society.

The following paper was read:—

"The Geology of North-West Hertfordshire and the adjacent parts of Bedfordshire and Buckinghamshire. Part I: Results of a Geological Survey of the Eastern Portion of the District." By T. E. Lones, M.A., LL.D., B.Sc.

The paper was illustrated by means of maps, sections, and diagrams. (Its publication is deferred until Part II is ready.)

229TH ORDINARY MEETING, 2ND DECEMBER, 1902, AT ST. ALBANS.

LEWIS EVANS, F.S.A., F.R.A.S., President, in the Chair.

Mr. Arthur Cottam, Mr. H. J. Bliss, and Mr. E. M. Jones were elected Members of the Society.

The following paper was read:—

"A Descriptive Catalogue of the Maps of the County of Hertford, Part II." By Herbert George Fordham. (*Transactions*, Vol. XI, pp. 173–212.)

The paper was illustrated by a collection of topographical works and county atlases.

The meeting was held in conjunction with the St. Albans and Hertfordshire Architectural and Archæological Society.

230TH ORDINARY MEETING, 16TH DECEMBER, 1902, AT WATFORD.

JOHN HOPKINSON, F.L.S., F.G.S., Assoc. Inst. C. E., in the Chair.

The following papers were read:—

1. "Notes on the Habits of some of our Lepidopterous Insects. I.—The Butterflies." By Arthur Cottam, F.R.A.S. (*Transactions*, Vol. XI, pp. 222–226.)

2. "On the Shrinkage of the Upper Sources of the River Lea." By James Saunders, A.L.S. (*Transactions*, Vol. XI, pp. 236–238.)

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3. "Some Recent Storms and Floods in Hertfordshire." By John Hopkinson, F.L.S., F.G.S., F. R. Met. Soc., Assoc. Inst. C. E. (*Transactions*, Vol. XI, pp. 239–244.)

4. "The Meteor of the 13th of July, 1902." As seen at Watford, by John Hopkinson. As seen at Hitchin, by Alfred Latchmore. (*Transactions*, Vol. XI, p. 244.)

5. "Historic Trees of Bedfordshire." By William Horley. (Communicated by James Saunders, A.L.S.)

The Author gave an account of the following trees:—The Abbot's Oak in Woburn Park, Queen Catherine's Oak in Ampthill Park, and the Monmouth Oak in Toddington Park.

The Abbot's Oak.—This stands in front of Woburn Abbey, and bears a tablet commemorative of the event which has made it historic. It is the tree upon which the Abbot, Thomas Hobbs, was hung in the reign of Henry VIII, in front of his monastery, for joining in an insurrection. The event is described in Dodd's 'History of Woburn and its Abbey,' 1818, and in Robinson's 'History of Woburn Abbey,' 1827; and the tree is illustrated in Strutt's 'Sylva Britannica,' 1826 (plate x).

Queen Catherine's Oak.—This is one of the many old oaks in Ampthill Park, and is said to have been a peculiar favourite of "good Queen Catherine" (Catherine of Arragon, first wife of Henry VIII), who resided in the old mansion-house of Ampthill, no longer existing, during her trial for divorce at Dunstable. It is described in a series of articles on our historic oaks which appeared in the 'Weekly Visitor' for 1852.

The Monmouth Oak.—This tree is about two hundred yards north of the Manor House of Toddington, and is surrounded by a fence. The Duke of Monmouth was married at the age of 14, without his consent, to Anne, Duchess of Buccleugh. The marriage was an unhappy one, and he fell in love with the Baroness Henrietta Maria Wentworth, of Toddington, and carved her initials on this tree. After his execution Lady Wentworth is said to have died of a broken heart. A mark still remains on the tree, but the initials "H. M. W." cannot now be made out.

Mr. Hopkinson said that Woburn Park was noteworthy in containing an ash-tree which was considered to be the largest in England. Its dimensions were given in 'English Forests and Forest Trees' (1857), and it formed plate xxii of Strutt's 'Sylva Britannica.' Loudon, in his 'Arboretum,' gave the dimensions of several taller trees, but of none which contained so great a bulk of timber.

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VOL. XI. PART 1.

CONTENTS:

PAGE

1. Hertfordshire Maps: a Descriptive Catalogue of the Maps of the County, 1579 to 1900. By Herbert George Fordham. Part I, 1579–1673. With six plates 1

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HERTFORD:
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HERTFORDSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.

THE objects of the Society are:—1. The investigation of the Meteorology, Geology, Botany, Zoology, Ethnology, Pre-Norman Archæology, and Topography of the County of Hertford. 2. The publication of the results of such investigation made by its Members. 3. The dissemination amongst its Members of information on Physics and Biology. 4. The formation of a Library of works on Natural History, and of a Museum illustrative of the Geology, Botany, and Zoology of the County (the Vertebrata excepted). 5. The discouragement of the practice of removing rare plants from the localities of which they are characteristic, and of exterminating rare birds, fish, and other animals.

Evening meetings of the Society are held in the rooms of the Watford Urban District Council (Upton House) once a month during the Winter and Spring. Evening meetings are also held occasionally at St. Albans, Hertford, and other places. Field meetings are held during the Spring and Summer in various parts of the County.

Members pay an Entrance Fee of 10*s*., and an Annual Subscription of 10*s*., for which they may, if preferred, compound by a payment of £5. Ladies are eligible for election.

Donations to the Society, and letters relating thereto, should be addressed to the Librarian, Daniel Hill, Herga, Watford. Subscriptions, etc., are payable to the Treasurer, John Weall, 38, High Street, Watford.

Members may obtain any of the publications of the Society, postage free, by remitting the price to the Assistant, H. Foxen, 38, High Street, Watford. They may also be obtained through any bookseller.

Forms of proposal for Membership, and any further information, may be obtained on application to either of the Honorary Secretaries—

A. E. GIBBS, F.L.S., Kitchener's Meads, St. Albans.
T. E. LONES, M.A., LL.D., Rokeby Lodge, Watford.

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ENGLAND AND WALES.

From 'A Direction for the English Traviller,' Jacob van Langeren, 1635.

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TRANSACTIONS

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I.

ERTFORDSHIRE MAPS:

A DESCRIPTIVE CATALOGUE OF THE MAPS OF THE COUNTY, 1579 TO 1900.

By Herbert George Fordham.

[1611.]

Read at Watford, 23rd October, 1900.

Introduction.

In the latter part of the sixteenth and the commencement of the seventeenth centuries cartography achieved a considerable development, dependent in a large measure on two causes—the increase of navigation and the invention of the arts of printing and of engraving on wood and copper.

So much attention was given to this subject that, in the first edition of his '*Theatrum Orbis Terrarum*' (1570), Ortelius was able to give, in a '*Catalogus Auctorum tabularum geographicarum*,' the names of nearly a hundred cartographers; and, in subsequent editions of his great work, Ortelius' list increases first to 134 and then to 170 names.

Many atlases and collections of maps, some with and some without historical and geographical letterpress, were published

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at this period. Most of these works had their origin in the Low Countries, where an important school of map-engravers and map-makers had grown up.

Of this school Gerhard Kramer, commonly known as Mercator (1512–1594), who first used the title 'Atlas' for a collection of maps, is esteemed as the founder of modern cartography;* and Abraham Ortelius of Antwerp (1527–1598), Jodocus Hondius of Amsterdam (1563–1611), and Henricus Hondius, his son, William Janszoon Blaeu (1571–1638),† and his two sons Jan Blaeu and Cornelis Blaeu, and Jan Janszoon of Antwerp, were well known and prolific in their work. Peter Keer also engraved a great many maps, although he was, apparently, not himself a publisher. Wenceslaus Hollar (1607–1677), a native of Bohemia, who settled in London, and engraved a vast number of portraits, views, plans, and maps, belongs to this period, although his maps were mostly published towards the end of the seventeenth century.

But native topographers and engravers were not wanting in the British Isles. The first modern map of England and Wales was the work of a Welshman, Humphrey Lhuyd of Denbighshire, and was published in 1569. A few years later Christopher Saxton brought out the first set of maps of the Counties of England and Wales, 35 in number. The surveying for and the draughting of these maps, which Saxton undertook and carried through successfully, must be esteemed a highly meritorious work, especially when one considers the means at his disposal; and for a century at least our county maps, whether engraved in England or on the Continent, are either copied from or almost entirely based upon his designs. Saxton's maps are now very rare in their original state and edition. They were published as a complete collection in 1579, the date on the engraved title-page, but the surveying and the publication of individual maps had then been going on for several years, some of the maps appearing as early as 1574 (Oxfordshire, Buckinghamshire, and Berkshire in one map, and Norfolk). Kent, Hampshire, Dorsetshire, Somersetshire, Devonshire, and Suffolk are dated 1575, and the remainder 1576, 1577, and 1578. Hertfordshire is of the year 1577, and is engraved by Nicholas Reynolds of London. This is the only map of Saxton's upon which Reynolds' name appears. Augustine Ryther, described as *Anglus*, engraved the frontispiece map of England, and also the maps of Gloucestershire, Yorkshire, Durham, and Westmorland.‡ Some of the maps are unsigned, others were the work of Remigius Hogenbergius, § Lenaert Terwoort of Antwerp, and other foreign artists.

* Ortelius calls him "*nostri sæculi Ptolemæus.*"

† William Blaeu was in 1633 appointed by public decree cartographer to the States-General; and it was his duty to examine the ships' logs and so amend the maps.

‡ Ryther, according to a note in the 'Typographical Antiquities,' Ames & Herbert, London, 1790, 3 vols., 4to (vol. iii, p. 1652), kept a shop a little way from Leadenhall, near the sign of the Tower.

§ Hogenbergius had settled in England, it seems.

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Passing from the great work of Saxton, John Norden (1548–1625 or 1626) follows, in 1593, with his '*Speculum Britanniæ*,' though, perhaps, the very interesting and artistic maps by Robert Adams and Ryther, showing the English and Spanish fleets and their engagements in the Channel, followed by a chart of the whole course of the Armada round the British Isles, published under the title and date, '*Expeditionis Hispanorum in Angliam vera descriptio*,' *Anno Do:* MDLXXXVIII, should be mentioned in passing as a specimen of native work.

Norden did not complete his design, and, though he surveyed other counties, he succeeded in publishing descriptions and maps of Middlesex (1593) and Hertfordshire (1598) only. In 1607 he issued his 'Surveyor's Dialogue,' which was subsequently several times reprinted, and in 1625 he published his last work, 'An Intended Guyde, For English Travailers' (without maps), to which I shall refer again. He seems to have contributed to the series of County Maps published by Speed in 1611,* as well as to the maps published in the folio edition of Camden's '*Britannia*' in 1607, of which those of Hampshire, Surrey, Sussex, Kent, Hertfordshire, and Middlesex are attributed to him. Norden's Hertfordshire appeared in 1598, under the title '*Speculi Britanniæ Pars*. The description of Hartfordshire.' The map is engraved by William Kip. The work is said to have been reprinted in 1637, and it was republished, with the map newly engraved by Senex, in 1723. This map is pretty closely copied from the original design, but has some differences.

Before quitting the county maps of the sixteenth century, I must call attention to the set of small maps copied from Saxton, and engraved by Peter Keer, or Pieter Van den Keere (in its Latinized form Petrus Kaerius). They are first found printed, so far as I have been able to discover, in 1617, with Camden's text condensed in Latin. Many of them bear the signature *Petrus Kaerius cælavit*, and a few are dated 1599. As they are obviously a uniform series, there can be no doubt but that they are all attributable to Keer and to the latter date.

But to revert to British cartography. In 1607, in the last Latin edition of Camden's '*Britannia*' (folio) published in the author's lifetime, we find a set of county maps by several engravers. They follow Saxton and Norden in design and detail. The same plates are used to illustrate Holland's translation of the '*Britannia*,' London, 1610,† and 1637, folio. Of the 53 county maps in these editions of Camden, 34 are engraved by William Kip, and 17 by William Hole. Hampshire, Surrey, Sussex, Kent, Hertfordshire, and Middlesex, as already noticed, are after Norden; the rest, with five exceptions only, are stated to be taken from Saxton.

* Preface to the 'Intended Guyde.'

† In the *Bibliothèque nationale*, Paris, is a copy of this edition with only the frontispiece map of England. It seems to be in its original binding, and therefore to have been published without the county maps found in other copies.

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John Speed's county maps in his 'Theatre of the Empire of Great Britaine' (1611, etc.) are nearly all of them signed by Jodocus Hondius and dated 1610, but these maps, like those of Saxton, were some of them engraved and published individually at earlier dates than that attributable to the collection as a whole, the earliest being apparently Oxfordshire, 1605. Some of them are said to have been engraved by Abraham Goos.*

The reprints, which are numerous and extend over more than a century in time, always retain the original engraver's name, and very often the original date, which is somewhat deceptive.

The different editions may be distinguished by the state of the impression, alterations and additions in the design itself, alterations in the publisher's imprint, and, as a last resource, by comparison of the text on the back, which differs in type and ornamentation in the various issues.† Speed, in addition to his great works, 'The Theatre of the Empire of Great Britaine' and the 'History of Great Britaine,' which were at first issued as one thick folio volume, but afterwards appeared separately, published an Epitome, or Abridgment, with Peter Keer's maps of 1599 (with English titles substituted on the plates for the original Latin, but otherwise unaltered) in small oblong 12mo, of which there were editions in 1620 (?), 1627, 1666, and 1676.

During the same period were appearing a set of curious little thin quarto books, consisting of engraved plates containing distance tables for the use of travellers, and minute skeleton maps of each county. The tables are copied from those in Norden's work of 1625.‡ In Norden's preface he says of the tables of distances: "It is a new invention . . . . But for want of perticall dimensuration, I have been enforced, to borrow the helpe, as well of mine owne Maps which I have made, by travaile of divers Shires: now totally finished by the laborious travailes of Mr. Speede, whose Maps together with Mr. Saxtons and mine owne, have been the principall direction in this tedious worke."

The first of these little books consists of a set of engraved plates four inches square, by Jacob van Langeren, dated 1635. The frontispiece is a circular map of England and Wales, which has been reproduced as the frontispiece of this Catalogue. As appears by the Latin inscription in the margin, it shows the counties and principal towns, and the number of the parishes in each county. It is engraved by William Kip. A second edition

* Gough's 'Anecdotes of British Topography' (1768), p. 42, note.

† The initial letter H, *ante* p. 1, is a facsimile of that on the back of the map of Herts in the first edition of the 'Theatre' (1611), with a figure of St. Nicholas, the patron Saint of travellers, which is frequently made use of in initial letters in topographical books of this period.

‡ 'England An Intended Guyde, For English Travailers. Shewing in generall, how far one Citie, and many Shire-Townes in England, are distant from other. Together, with the Shires in particular: and the Cheife Townes in every of them. With a generall Table, of the most of the principall Townes in Wales.' Invented and Collected, By John Norden. *Voluntas pro facultate.*

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appeared in the following year. In this, in the copy in the British Museum, is inserted an additional page of letterpress printed from type. These two editions were both sold by Mathew Simons. The only copies I have ever seen are two (1635 and 1636) in the British Museum and one (1636) in the Bodleian Library. The table and map of Herts from this work are also reproduced in facsimile (Plate VI).

In 1657 appeared a fuller work founded on those published by Simons: 'A Book of the Names of all Parishes, Market Towns, Villages, Hamblets, and Smallest Places, in England and Wales. Alphabetically set down, as they be in every Shire. With the Names of the Hundreds in which they are, and how many Towns there are in every Hundred,' etc. It was published by Thomas Jenner, and contained a printed list of places, together with impressions from the original plates of Van Langeren altered by the obliteration of his skeleton maps, and the insertion in their place of larger and more detailed, though still very small maps of the counties. This 'Book of the Names' was republished in 1662 (Samuel Pepys' copy, preserved in the Pepysian Library at Magdalen College, Cambridge, is of this date) and 1668, by Jenner, and again by John Garret in 1677. The tables of distances were again used, copied in the same form on a larger scale, in the '*Magna Britannia et Hibernia*' of the Rev. Thomas Cox, published 1720–31, 6 vols., 4to.

In the middle of the seventeenth century the rival families of Blaeu and Jansson were publishing in Holland their large folio atlases, with editions in various languages (Latin, French, German, Spanish, Dutch, and Flemish), incorporating verbatim, in the volume appropriated to England, the text of Camden, and with maps of the English counties. Blaeu gives Hertfordshire in one map.* In Jansson's atlas Middlesex and Hertfordshire are in the same sheet. The series of earlier maps is closed by Richard Blome, who, in his '*Britannia*' (1673), folio, copies his predecessors, but in very poor style.

Contemporaneously with the development of cartography in the Low Countries, a school of geographers was growing up in France, of which Nicolas Sanson, of Abbeville (1600–67), who was royal geographer from 1627, and his sons Nicolas, Adrien, and Guillaume Sanson were the earlier and more prolific members. They were succeeded by other eminent workers, and in the middle of the eighteenth century France is described as "*facile princeps* in cartographic achievements." As, however, no English county maps appear to have been printed in any of the French atlases, I need not refer further to this school.

Towards the end of the seventeenth century, when the Dutch school of engravers and map-makers, so prolific in its day, seems to have entirely died out, the English engravers became more numerous, and, during the following century, they produced many

* The tailpiece on p. 32 is taken from Blaeu's map of Herts.

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complete series of county maps. Beginning with Seller and Oliver in 1676, and commencing the new century with Robert Morden, who, in his turn, was succeeded by Kitchin, Bowen, and others, we come at length to the more finished, accurate, and modern-looking maps of Warburton, Dury and Andrews, Ellis, and Cary. Bowen and Kitchin's maps are notable for the large amount of letterpress description and historical matter inserted on the face of the maps and in the margins. These series of maps are also characterized by the insertion of roads, and their gradual development as one of the most important features of the design. Ogilby's maps, indeed (1675), are nothing more than pictorial itineraries, consisting of long strips showing the roads with notes and details of the geographical features of the adjacent country. The title of Ogilby's '*Britannia*' gives a good idea of his work;* it was dedicated to Charles II.

The maps of this period, though very much more numerous and varied than those which preceded them, require no detailed notice here. Particulars will be found in the Catalogue itself.

In the nineteenth century the Ordnance Survey gave an exact basis for all maps, and an era of uniformity naturally set in, the interest of originality of design and ornament disappearing almost entirely.

The surveying, so far as the work of triangulation is concerned, was commenced in 1784, and the first sheet of the one-inch map was published on the 1st of January, 1801. It may perhaps be noticed how very closely the style of Cary's maps was followed by the Survey, a tribute to the excellence of his work.

It will be seen from the foregoing that the era of county maps (1579–1900) is roughly divisible into three periods, distinguishable by the character of the maps and the scientific and artistic excellence of the work produced. The first period is one of considerable pictorial effect, with but little geographical detail or accuracy. The earlier map-makers found large scope for ornamentation in the poverty of their actual geographical knowledge, and habitually filled all blank spaces in their designs with ornaments of one kind or another. Thus the sea is usually decorated with ships, sometimes engaged in naval warfare, and with marine monsters and grotesque and allegorical figures; scrolls, coats of arms, and emblematic and historic figures are also largely utilized. Their maps contain, in general, indications of towns and villages, with the boundaries of the counties and hundreds, and show the

* 'Britannia, Volume the First, or, an Illustration of the Kingdom of England and Dominion of Wales: By a Geographical and Historical Description of the Principal Roads thereof Actually Admeasured and Delineated in a Century of Whole-Sheet Copper-Sculps. Accomodated With the Ichnography of the Several Cities and Capital Towns; and compleated By an Accurate Account of the more Remarkable Passages of Antiquity. Together with a novel Discourse of the Present State.' By John Ogilby, Esq: His Majesty's Cosmographer, and Master of His Majesty's Revels in the Kingdom of Ireland. London, Printed by the Author at his House in White-Fryers. M.DC.LXXV (large folio).

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course of the main streams of the rivers; the rest of the space is filled in with outlines of hills and figures of trees somewhat arbitrarily distributed.

The second period is marked by more success from a cartographic point of view, more detail, especially in respect to ways of communication, and less adventitious ornament, and ultimately large-scale county maps showing the parish boundaries and other minor features were attempted. Roads, with particulars of their state of repair and the distances marked upon them, became an important feature, and much information was printed in the form of notes on the face of the map itself. The following are specimens of these notes:—

"Hartford was a place of note before the Roman Invasion, and long after was a principal City and Royal Seat of the East Saxons. Alfred first built a Castle here, to protect it from the devouring Danes. Here are two Churches, S^{t} Andrew and All Saints. The People deal largely in Wheat, Malt and Wool. 'T is said that this Town and Ware send above 5000 Quarters of Malt to London Weekly by Water."

"S^{t} Albans the Antient Verulam, 21 miles from London, derives its Name from Alban, the first British Martyr; who suffer'd in y^{e} persecution under Dioclesion. There are 3 Churches here, besides that call'd S^{t} Albans. The Market is one of y^{e} best for Wheat in England."

"Ware 20 miles from London; Great quantities of Malt and Corn are sent to London from this Town Weekly in Barges by the River Lee. At Amwell within a mile of this Town, is the Source of the New River, which supplies London and great part of Westminster with Water."

"Bishop Stortford is a well built Town, in the form of a Cross, with four Streets answering to the four Cardinal Points of the Compass. It is Situate in a dry Soil, and in a pleasant healthy Air. Here are many good Inns; the Church has a handsome Tower with a Ring of 8 bells, but the chief Ornament of the Place is its Grammar School. On y^{e} East side of the River is S^{t} Osyth's Well, whose Water was held in great esteem for sore Eyes."

(All from the map of Hartfordshire by Eman: Bowen, in the 'Atlas Anglicanus, Or a Complete Sett of Maps of the Counties of South Britain; . . . By the late Emanuel Bowen, Geographer to His Majesty George II^{d}, and Thomas Bowen.' London, folio, n.d., but published about 1770.)

"Hitchin is reputed the second Town in the County for number of Houses, Streets and Inhabitants, it was formerly a place of great note for the Woolen Manufacture, but now that Trade is quite lost, however, their Market for Grain, especially malt is still much frequented."

(From 'A New Improved Map of Hartfordshire,' by Thomas Kitchin, from Kitchin's large atlas, London, large folio, n.d., but published about 1763.)

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In the third period the Ordnance Survey becomes the basis of all maps, whether published by public authority or private effort, and the maps have thus a certain stereotyped excellence and uniformity of matter and detail which cannot be mistaken.

But this classification, although sound, is somewhat vague in its limits in point of time, and I prefer one more scientific in its foundation, but which substantially, though more accurately, defines much the same periods.

The early map-makers adopted as a basis either the meridian of the Azores or of the Canary Islands, which had come down to them from Ptolemy, but there was a good deal of doubt about the matter, and consequent variation in the meridian of longitude selected by different geographers. Blaeu, in the preface to the first part of his '*Novus Atlas*' (1638, French edition) says:—"*Ptolomée a mis le premier Meridien aux Isles Fortunées, qu'on nomme aujourd'huy Canaries; et depuis les mariniers Espagnols l'ont mis aux Isles des Assores, et mesmes quelques-uns au milieu de l'Espagne.*" Camden also, in his address to the Reader, which is the preface to his edition (Latin) of 1607, as translated by Philemon Holland (1610), deals with the then current difficulty thus:—"Mathematicians wil accuse me as though I had wholy missed the mark in the Cosmographical dimentions of longitude, and latitude. Yet heare me I pray you. I have carefully conferred the Locall tables new and old, Manuscript, and printed, of Oxford and Cambridge, and King Henry the Fifth. In the latitude they doe not vary much from Ptolomy, but agree wel together, neither do I thereupon imagine with Stadius, that the globe of the earth is removed from his centre, therefore I have relied upon them. But in the Longitude there is no accord, no consent at all. What should I then doe? When as therefore the moderne navigators have observed that there is no variation of the Compasse at the Isles of Asores,* I have thence begun with them, the account of Longitude as from the first Meridian, which yet I have not precisely measured."

Martin Cortes, in his book on 'The Arte of Navigation,' published at Seville in 1556,† lays down the rule that for a first meridian of longitude we should draw a vertical line "through the Azores, or nearer Spain, where the chart is less occupied." In the black-letter pamphlet of 1594 entitled 'The Seamens Secrets,' the author, the celebrated navigator John Davis, states that the first meridian passed through St. Michael, because there was no variation at that place;* the meridian passing through the magnetic pole

* The identity of the magnetic meridian with any particular meridian at a given time was, of course, an entirely unsound basis for fixing the first meridian of longitude, as the variation of the compass at any point on the earth's surface is never constant. In 1581 the variation at London was 11° 15′ E.; in 1657 there was no variation there, and it moved westerly until 1815, when it was 24° 27′ W., and is now returning eastwards. (See '*Encyclopædia Britannica*,' 9th ed., vol. x (1879), article 'Geography,' at p. 187.)

† English translation, London, 1561.

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as well as the pole of the earth. St. Michael is the largest island in the group of the Azores; from its western extremity London should be 25° 54′ E., the island extending E. and W. between 25° and 26° W. of Greenwich.*

This vague western meridian was continued in use, so far as British maps were concerned at all events, until towards the end of the seventeenth century. In Blome's '*Britannia*' (1673) the county maps have no indications of the meridian, but the map of the British Isles which is engraved by Francis Lamb, and is dated 1669, places London at 20° 30′ East longitude, which is probably based on an initial meridian passing through one of the most westerly of the Canaries rather than through the Azores, though an accurate measurement would lie between those two groups of islands.

In Seller's map of Herts (1676) the meridian of London first appears. It was from that date uniformly used until about the end of the next century, and when fixed more exactly the meridian passes through St. Paul's Cathedral.

Although the Greenwich Observatory was founded as early as 1675, it does not appear as the point of the initial meridian of longitude until the end of the eighteenth century, the general adoption of Greenwich in lieu of London being, no doubt, contemporaneous with the triangulation for the Ordnance Survey maps, commenced in 1784. Cary's set of county maps dated 1787 (with their reprints of later dates) have the meridian of St. Paul's, London, but in his 'New Map of England and Wales, with part of Scotland,' published in sheets, and dated June 11th, 1794, he adopts the meridian of Greenwich, and this appears to be the earliest map upon which this meridian was used.

Thus I arrive at three convenient periods for the classification and study of our county maps, and I divide my Catalogue accordingly, as follows:—

PART I: 1579–1673 (*Saxton to Blome*).

The early and archaic maps: Period of the Dutch School, and of the meridian of the Azores or Canaries.

PART II: 1673–1794 (*Seller to Cary*).

The modern and detailed maps, with roads: Period of the English School, and of the meridian of London.

PART III: 1794–1900.

Period of the Ordnance Survey, and of the meridian of Greenwich.

I have been at some pains in selecting for the purpose of illustration maps and plans representative, so far as possible, of the progress of the cartographic art as applied to our county maps at different periods. The reproductions have been made by the photozincographic process, and are thus exact facsimiles, the

* See '*Encyclopædia Britannica*,' 9th ed., vol. iii, p. 170, article 'Azores,' and vol. xvii, pp. 251, 252, and 254, article 'Navigation.'

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dimensions of the original in every case having been exactly followed, except where otherwise stated.

The small general map of England forming the frontispiece is a fine and delicately engraved work by William Kip, printed in 1635 and again in 1636, in the 'Direction for the English Traviller,' London, 4to. It represents the best art of the early period from an engraver's and cartographic point of view. Norden's map of 1598, from the '*Speculi Britanniæ Pars*,' and Peter Keer's little map engraved in 1599 and first published in 1617, are good typical specimens of the first maps of the county. Robert Morden's small map (1704), with its roads and other details, marks the advance made in a century, and may be compared both with the early maps and those of a later date, and, finally, a plan of Hertford, from the 6-inch Ordnance Survey Map of 1884, represents the most modern and perfect phase of map delineation. A careful comparison of the maps of these epochs, as here represented, and better still in a large collection, will give a clearer idea of the whole subject than many pages of descriptive letterpress. The Table of Distances, with the Thumb-nail map of Herts engraved by Van Langeren, and printed in 1635 and 1636, is reproduced *à titre de curiosité*. The copies in the British Museum, except for one in the Bodleian Library, are, so far as I know, unique. This is probably the smallest map of the county in existence. The plan of Hertford taken from the map of Herts engraved by Jodocus Hondius in 1610, and published in Speed's 'Theatre' of 1611 and subsequent dates, as well as the view of St. Albans from the same map, may also be compared with the Ordnance map of Hertford of 1884. A few designs from Hertfordshire maps and from historical works on the county are used for the purpose of ornament in the letterpress. The date is affixed to each, and they are noted in the list of illustrations, to which reference may be made.

In the Catalogue I have arrived at a very complete description of the earlier and necessarily little-known maps, and have appended, where it seemed desirable, notes on the works in which they were published. Of the later maps, and especially of those published in the nineteenth century, much less detail has been necessary. They are most of them easily accessible, and present few features of particular interest.

The maps are catalogued under the names of the authors of the works which they illustrate, as being a practice more consonant with that of the public and other large libraries, than the other possible plan of following the names of the engravers or publishers of the maps themselves. But individual maps, which did not appear in such works, are either indexed by the name of the publisher or engraver, or (in a few cases only) by the title upon the map or atlas where no publisher's or engraver's name appears. They are arranged as closely as possible in the order of date of publication, each separate edition occurring in its chronological sequence. The name of the engraver, and the original date of the engraving when it differs from the date of the publication, are

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given, the latter in [ ]. When a map is (as is frequently the case, especially amongst the earlier maps) a reprint, either from an untouched original plate, or else from one but slightly altered or amended, an asterisk (*) is prefixed to the number, and only the size and scale, engraver's name, and a reference to the original date are given. When a date is doubtful a mark of interrogation (?) is added; when it is approximate only it is followed by (c) = *circa*. All maps are rectangular unless otherwise stated. The dimensions, except in very small maps, are generally given in inches and to the nearest quarter of an inch. The first figure is that of the width, the second that of the height. The scale is uniformly stated, but in the earlier maps it is only approximate, and often very vague.

The principal private collections of Hertfordshire maps are those of Mr. W. F. Andrews, of Hertford, Mr. Lewis Evans, F.S.A., of Barnes Lodge, King's Langley,* and Mr. R. P. Greg, F.G.S., of Coles Park, Buntingford. I am greatly indebted to these gentlemen for the assistance they have given me in my researches. Without their co-operation and the loan of their collections for examination and comparison, my work would have been impossible. I have also examined the British Museum Library; the Inner Temple Library; the University Library, Cambridge; the Bodleian Library, Oxford; the Pepysian Library, Magdalen College, Cambridge; the *Bibliothèque nationale*, Paris; the Library of the Royal Geographical Society, London; and the collection of maps of Mr. Alexander Peckover, of Wisbech.

As the result of these studies, which have been certainly much more laborious than the subject would at first sight seem to demand, I hope that very few (if any) maps of the county have escaped my notice. Certainly none of any real consequence or representative interest have been omitted.

A short bibliography of the subject will be added, as well as an Index to the names of Authors, Engravers, etc.

* This collection has recently been acquired by the Hertfordshire County Museum, St. Albans.

ARMS OF

HERTFORD.

[1720.]

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CATALOGUE.

Part I: 1579–1673.

1579. Saxton, Christopher. 20 × 15¾. Scale, about 2 miles = 1 inch. Engraved by Nicholas Reynolds, of London [1577].

Shows the hundreds, rivers, with bridges, towns, villages, with churches, hills, parks, and woods (indicated by coarsely-figured trees). Plain double-line margin. On scrolls in margin "*Septentrio*," "*Orions*," "*Meridies*," and "*Occidens*." Left-hand top corner filled by panel with scrolls, bunches of pears, grapes, apples, and pendent leaves, and large coat of royal arms with imperial crown and supporters, and below, in rectangular panel, "*Hartfordiæ Comitatus nova, vera, ac particularis descriptio, Anno Dni* 1577." In left-hand bottom corner large, open pair of compasses standing on scale of (10) miles, with scroll bearing, "*Christoferus, Sa . . . xton descripsit, et Nicholaus Rey . . . noldus Londinien . . . sis sculpsit.*" In right-hand bottom corner small coat of arms of Thomas Seckford, Master of the Requests to Queen Elizabeth (who was patron of Saxton's undertaking), with motto above, "*Industria naturam ornat.*"

From Saxton's Atlas of 35 maps of England and Wales, no title, London, 1579, folio.

This is the first set of county maps of England and Wales. "Saxton spent nine years in travelling over the whole kingdom, of which he made a general survey, and separate ones of the counties. Thomas Seckford, master of the requests to Q. Elizabeth, was the promoter of this undertaking, procuring him a licence to imprint maps for England or any county therein for ten years.* . . . . To the whole set are prefixed 84 coats of arms of the nobility, a Latin catalogue of cities, bishoprics, market towns, castles, parish churches, rivers, bridges, groves, forests, inclosures in each county in England and Wales; and an alphabetical and other index of the maps, and the judges' circuits." † The earliest of the maps are dated 1574, others 1575, 1576, 1577, and 1578, and the map of England and the Title Page are 1579.

(Reprinted 1645, with the maps unaltered but redated (Herts, 1642); by Peter Stent in 1652 (?) and 1665 (?); by Philip Lea, without date, but subsequent to 1689, the maps being, some of them, redated, e.g. Hereford 1665, Somerset 1685, Wilts 1689; and perhaps again later. In the reprints after 1645, the marginal ornamentation is much cut about and altered in many of the counties.)

* This licence is printed *in extenso* in a note at pp. 1649–50 of vol. iii of the 'Typographical Antiquities: or an Historical Account of the Origin and Progress of Printing in Great Britain and Ireland,' by Joseph Ames and William Herbert. London, 1790, 3 vols., 4to. It is dated 1577.

† 'Anecdotes of British Topography' [Richard Gough], London, 1768, 4to, at pp. 40, 41.

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HERTF

From ' The Description of H

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A fold in the middle of the map has rendered the pl

RDSHIRE.

rtfordshire,' John Norden, 1598.

te slightly imperfect, and it is smaller than the original.

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1598. Norden, John. $9\frac{2}{16} \times 7\frac{1}{16}$. Scale, about 4 miles = 1 inch. Engraved by William Kip.

This map shows the hundreds, rivers, principal roads, indicated by double dotted lines, towns, villages, with churches and hamlets, hills, parks, and woods, and figures of armed men representing the sites of battles. It is divided by horizontal and vertical lines into ½ inch squares (= 2 miles), indicated in margins, at sides by letters *a* to *o*, and at top and bottom by even numbers, 2 to 36. Plain margin. In left top corner in plain long panel, in capital letters, "Hartford Shire," and below, circular, crowned and ornamented scroll with royal shield and motto, "*Honi . Soit . Qui . Mal . Y . Pence.*" In left bottom corner, "*Scala Milliarium.*" The right-hand top corner has a smaller circular band with crown and motto, and blank shield in centre. On right-hand side an indicator of the points of the compass, and in the bottom right-hand corner a rectangular panel with ornamented margin, and the inscription "*Joannes Norden perambulavit et descripsit* 1598 *Wilhelmus kip Sculpsit.*"

From the '*Speculi Britanniæ Pars.* The description of Hartfordshire,' by John Norden. London, 1598. 4to. The '*Speculum Britanniæ.* The first parte,' containing Middlesex, was published by Norden in 1593,* with a map of that county, and these two parts were all that appeared. The manuscript of Hertfordshire is in the Lambeth Library (Catalogue of MSS., No. 521); both the MS. and map are dated 1597.

"Norden was the first Englishman who designed a complete series of county histories, and he essayed his task with boundless energy. . . . But the task was beset with difficulties, mainly pecuniary. In 1596 he published a 'Preparative' to his '*Speculum Britanniæ.*' . . . In 1607 Norden published his 'Surveyor's Dialogue,' which was republished in 1610, 1618, and 1758, and it was re-edited in 1855 by J. W. Papworth in the Architectural Society's Publication, vi, 409. . . . Norden's latest published work as a topographer was 'England, An intended Guyde for English Travellers,' 1625, 4to, a series of distance tables intended to be used with Speed's set of county maps. Norden probably died soon after its publication." †

(Reprinted in 1637 in quarto, but I have never been able to identify a copy of this date, beyond finding in the Gough Collection in the Bodleian Library a mutilated title-page so dated, but which may possibly not belong to Norden's work at all, although it is bound up with it. There is a reprint, whether that of 1637 or of a later date seems doubtful, in which the date and the engraver's name in the panel in the right-hand bottom corner are erased,

* It is entitled '*Speculum Britanniæ.* The first parte. An historicall and chorographicall discription of Middlesex. . . . . By the Travaile and vew of John Norden, Anno 1593,' and contains, besides the map of Middlesex, one of London, and one of Westminster.

† 'Dictionary of National Biography,' vol. xli (1895), article 'Norden, John (1548–1625 ?), topographer.'

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and there is added on the map to the left of the panel, "Printed and sold by John Garrett at the south Entrance of ye Royall Exchange in Cornhill." The '*Speculum Britanniæ*' was republished in facsimile in 1723, the map of Herts being re-engraved by J. Senex. It differs in some particulars from the original.)

1607. Camden, William. 14 × 11¼. Scale, 2½ miles = 1 inch. Engraved by William Kip, after Norden.

A plain map, showing the hundreds, rivers, towns and villages, and parks, with trees and hills figured. In left top corner, in panel, "*Hertfordiæ comitatus a Cattifuclanis* (sic) *olim inhabitatus*," and below, names of the hundreds in two columns, thus:—

THE NAMES OF THE HUNDREDS OF THE MAPPE.

1. Caisho Hundred.
2. Dacorum Hundred.
3. Hitch halfe Hūdred.
4. Broad water Hundred.
5. Odsey Hundred.
6. Edwinstree Hundred.
7. Braghinge Hundred.
8. Hartforde Hundred.

In left bottom corner, "*Scala Milliarium*" and "*Johannes Norden perambulavit et descripsit Wilhelmi kip Sculpsit.*" In right bottom corner, indicator of cardinal points. Latin text printed on back.

From Camden's '*Britannia*,' the last Latin edition published by Camden himself (he died in 1623), and the first with county maps. London, 1607, folio. The imprint on the title-page is, "*Londini, Impensis Georgii Bishop et Joannis Norton.* M.DC.VII."

(Reprinted in 1610 and again in 1637, in Philemon Holland's English translation of the '*Britannia*'; both editions, London, folio.)

***1610. Camden, William.** 14 × 11¼. Scale, 2½ miles = 1 inch. Engraved by William Kip, after Norden.

This is a reprint of the map of 1607 (q.v.), but is distinguishable from it by the absence of text on the back.

From Camden's '*Britannia*,' Philemon Holland's English translation, the first edition, London, 1610, folio. The imprint on the title-page is that of the Latin edition of 1607, with the date M.DC.X. There is a copy of this edition in the *Bibliothèque nationale*, Paris, without the county maps.

1610. Speed, John. 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Imprint as in the map in the 'Theatre' of 1611 (q.v.). No text on the back. For full description see 1611, Speed, p. 15, *post.*

This is an atlas of the maps of Speed in which in many cases the engraving is not completed, and blank spaces occur in the margins, and it is evidently a collection of the maps prior to their completion and publication in the 'Theatre.' The map of Oxfordshire bears the date 1605, and those of Anglesey and Brecknockshire are dated 1608, others 1610. A copy of the atlas in the British Museum is dated in the Catalogue "1610 (?)."

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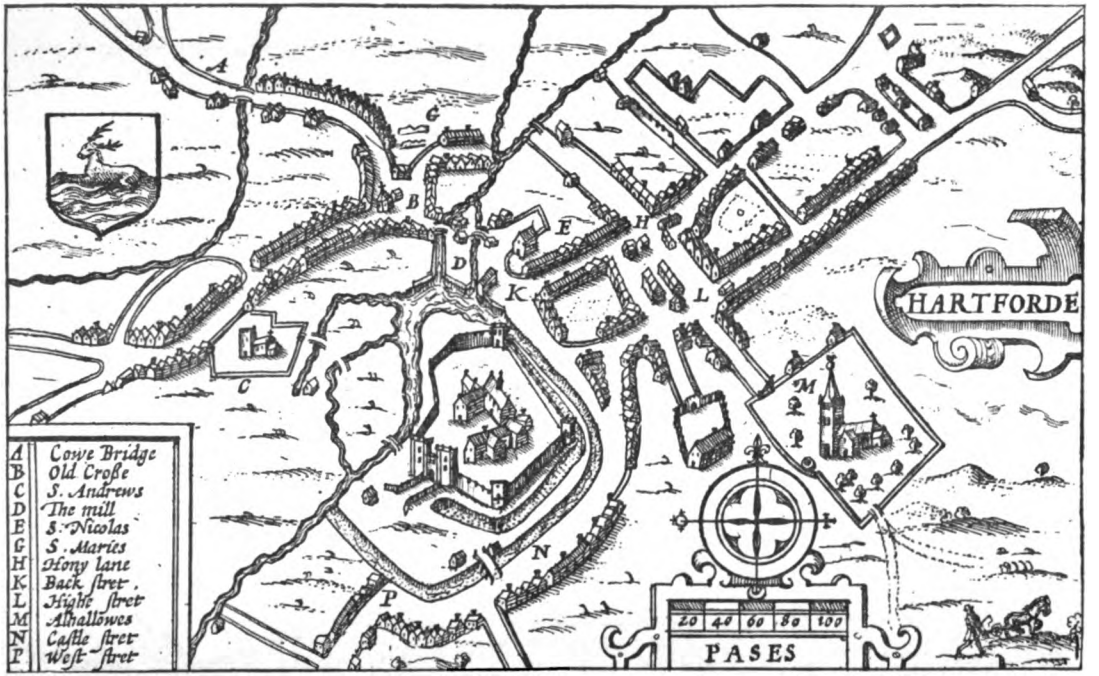

PLAN OF HERTFORD.

From the Map of Herts in the 'Theatre of the Empire of Great Britaine,' John Speed, 1611.

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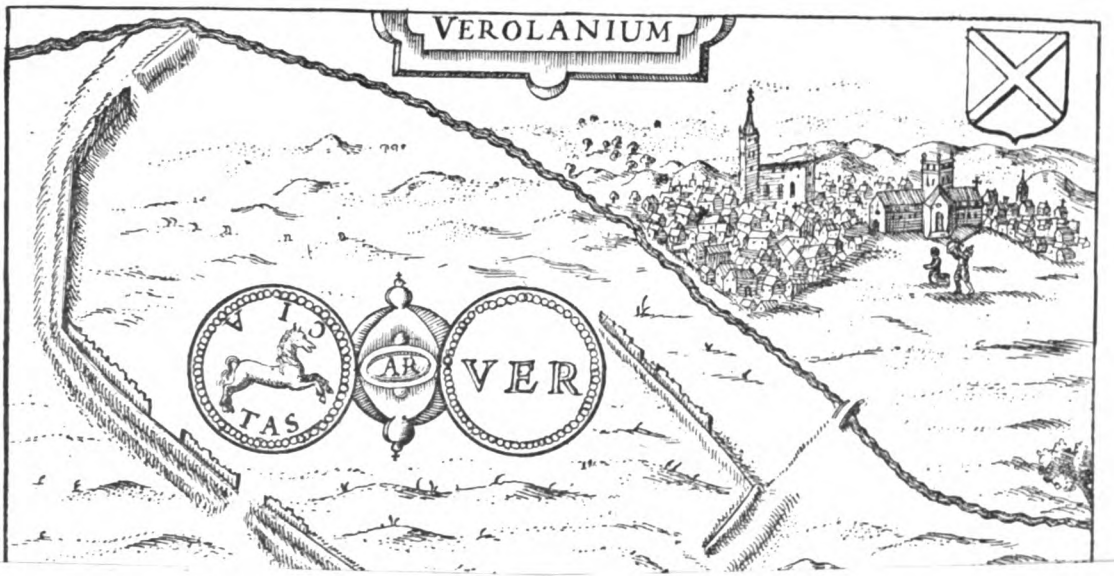

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1611. Speed, John. 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Shows hundreds, rivers and bridges, towns, villages and hamlets, with churches and beacons, hills, very coarsely drawn, enclosed parks, and woods, as well as the sites of the battles of St. Albans (indicated by a tent and a group of foot-soldiers fighting). The names of the hundreds and of British tribes are inserted in the map. Narrow, slightly ornamented border, with "North," "East," "South," and "West." In centre at top of map, in long, narrow, plain panel, "Hartford Shire described. The sittuations of Hartford, and the most ancient towne S. Albons with such memorable actions as have happened." In the right-hand top corner is a plan of "*Verolanium*" (*sic*), with view of the city of St. Albans, and of the martyrdom of Saint Alban, and with the city arms in its right top corner, 5¾ × 3½ (reproduced in facsimile, Plate IV). In the left-hand top corner is a map of "Hartforde," with a list of the streets and principal buildings (indicated by letters on the map), a scale of (100) "Pases," and the coat of arms of the town in its left top corner, 5¾ × 3½ (Plate III). Below the map of Hertford, shields with crowns, of "Roger Erle of Clare and Harford," and "Edward Seinour (*sic*) Erle of Hartford." Below the plan and view of St. Albans, a nearly square panel with an account of "Old Verolam." Below this, again, three groups of soldiers engaged; two on the left being horsemen armed with lances, and the third, on the right, both foot and horse, the foot-soldiers using firearms. In the left-hand bottom corner is a female figure, more than half length, with a globe and square and compasses on a slab before her, and holding at arms-length above her with the left hand an armillary sphere from which is pendent a ribbon. In the right-hand bottom corner, in a large, nearly square panel, an account of the three battles figured above, viz., St. Albans 1455 and 1461, and Barnet 1471. At the bottom of the map, in the centre, a scale of 10 miles, and open compasses above. To the left "*Jodocus Hondius cælavit,*" and again further to the left "Performed by John Speede and are to be sold in Popes head alley by John Sudbury and George Humbell *Cum Privilegio.*" On the back of this map is a description of Hertfordshire in (nine) paragraphs on one side, and a list of the Hundreds, and of the towns, villages, etc., arranged in alphabetical order in five columns, on the other. This text is distinguishable from later impressions by a scrolled heading across the page with a blank shield in its centre, and by an initial letter H, with a standing figure of St. Nicholas with staff, and an ornamental border. (This initial letter is reproduced in the text at p. 1, *ante.*)

From Speed's 'Theatre of the Empire of Great Britaine,' London, 1611–12, folio. Speed published between 1608 and 1610 a series of 54 maps of the counties of England and Wales. This collection appears to have had no title or text; several of the maps are dated; the earliest are Oxfordshire 1605, and Anglesey and Brecknockshire 1608. The Hertfordshire map is identical with

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the impression of 1611, and has the same booksellers' imprint, but no date. Several of the maps in this first issue want much of the marginal details which were afterwards inserted, and have considerable blank spaces in consequence. The 'Theatre' was first published in 1611–12 as the Chorographical Part of Speed's 'History of Great Britaine' (in four books, of which the first three are dated 1611, and the fourth, Ireland, 1612), the 'History' itself being distinguished as the Historicall Part and divided into six books. The whole work, in this edition, has continuous pagination. The text of Hertfordshire and the map of the county form chapter xx of Book 1, and the letterpress is paged 39 and 40. The 'Theatre' and 'History' both appear separately in many later editions of various dates. The full title of the first edition of the 'Theatre' is as follows:—'The Theatre of the Empire of Great Britaine: Presenting An Exact Geography of the Kingdomes of England, Scotland, Ireland, and the Isles adioyning: with the Shires, Hundreds, Cities and Shire townes, within ye Kingdome of England, divided and described By John Speed. Imprinted at London *Anno Cum Privilegio* 1611. And are to be solde by John Sudbury and Georg Humble, in Popes-head alley at ye signe of ye White horse.' Of the 'Theatre,' and of the maps contained in it, there are a great number of editions running over a period of more than a century. Individual maps of Herts are difficult to identify with the editions to which they belong, as the maps are unaltered (beyond the insertion of roads in the later editions) except as regards the booksellers' imprint, and the text on the back. Some of the later editions of the maps are simple atlases without descriptive text. So far as has been possible, these various impressions of the map of Hertfordshire are arranged and dated in this Catalogue, but in some cases there is considerable doubt as to their identification, and I cannot say with any certainty that my list is exhaustive.

(Reprinted 1614 (Theatre), 1616 (Theatrum, Latin text), 1627 (Theatre), 1646 (Theatrum, Latin text), 1650 and 1657 (?) (Theatre), 1662 and 1666 (without text), 1676 (Theatre), and 1713 and 1736 (without text).)

***1614. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Probably an unaltered impression of the map of 1611, with the same imprint.

This is from the second edition of the 'Theatre,' London, 1614, folio. The title-page is that of the first edition, redated, but with the same imprint. I have not seen a copy of this edition, and cannot therefore fix the map by the indications mentioned under the first edition.

***1616. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

An unaltered impression of the map of 1611, with the same imprint. Distinguishable by the Latin text on back. There is no

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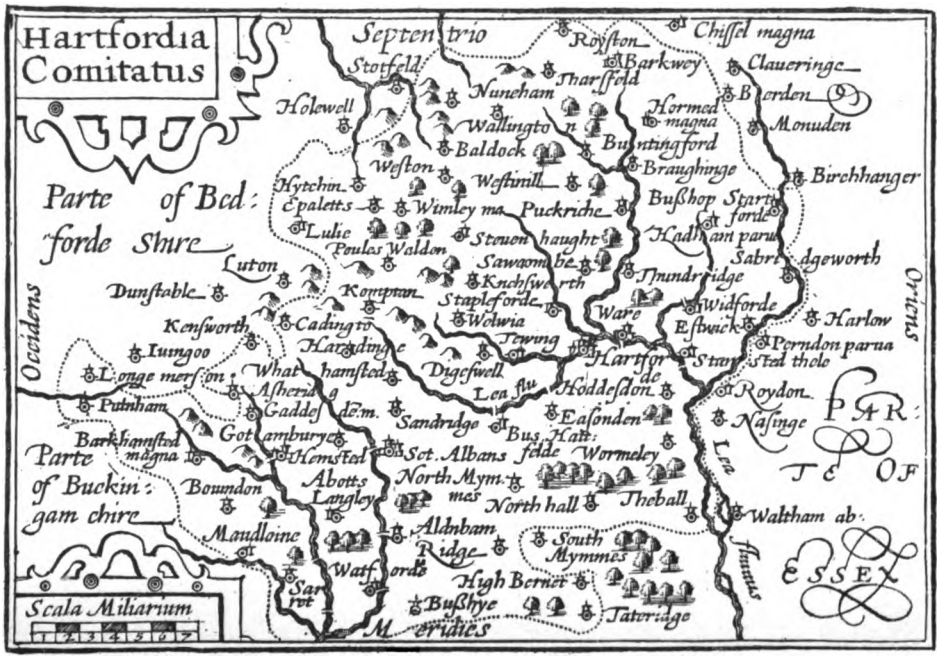

HERTFORDSHIRE.

From a Latin epitome of Camden's '*Britannia*,' Regnerus Vitellius, 1617.

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scroll-heading to the chapter. The initial H contains a figure of St. Nicholas like that on the back of the maps of the English editions of the 'Theatre' of 1611 and 1627, but the border of the design round the initial letter differs slightly from either.

From the first edition of the Latin translation of Speed's 'Theatre' by Philemon Holland, London, 1616, folio. The only copy I have seen is one in the *Bibliothèque nationale* at Paris. Bound in at the end of this volume, and uniform with it, is '*Petri Kaerii Germania Inferior*,' etc., Amsterdam, 1662, folio. There is a second edition of this Latin version of the 'Theatre,' published in 1646 by John Blaeu at Amsterdam (q.v.).

1617. Camden, William. $4\frac{1}{16} \times 3\frac{5}{16}$. Scale, 8 miles = 1 inch. Engraved by Peter Keer, after Saxton [1599].

A plain map, exactly following Saxton's map of 1577 in the details and the spelling of the names, except that the boundaries of the hundreds, and the parks, are omitted. Shows the county boundary, rivers, with bridges, towns and villages, and hills and trees coarsely figured. Plain, double-lined border. Within margin, "*Septen . . . trio*," "*Oriens*," "*M . . . eridies*," and "*Occidens*." In left top corner, in panel, "*Hartfordia Comitatus*." In left bottom corner "*Scala Miliarium*," with scale of 7 miles. This map has on the face a printer's mark, "Q. 3" (omitted in the reproduction, Plate V), and on the back the Latin text of the abridgment of Camden's '*Britannia*' which it illustrates.

From a Latin abridgment or epitome of Camden's '*Britannia*,' published by William Jansson, at Amsterdam, 1617, sm. 8vo. Title: '*Guilielmi Camdeni, Viri Clarissimi, Britannia, sive florentissimorum Regnorum Angliæ, Scotiæ, Hiberniæ, et Insularum adjacentium ex intima antiquitate descriptio. In epitomen contracta à Regnero Vitellio Zirizæo, et Tabulis Chorographicis illustrata.*' *Amstelredami, Ex Officina Guilielmi Janssonii*, M.DC.XVII.

There is a smaller reprint of this epitome published by William Blaeu, 1639, 12mo, which contains two maps of Great Britain, and maps in sections containing a number of counties in one, reduced from larger sectional maps of an earlier date by Mercator and H. Hondius.

The series of small maps of the English and Welsh counties, etc., in which the above map of Hertfordshire occurs, engraved by Petrus Kaerius (or Peter Keer) in 1599, is reprinted in the epitome of Speed's 'Theatre' 1620 (?), 1627, 1666, and 1676, London, obl. 12mo, in which impressions the titles of the maps are inserted in English, and there is no text on the back of the maps, the map of Hertfordshire being numbered 19. The above is from the earliest set of these maps I have found, and the only one in which the titles are in Latin. Many of them are signed by the engraver "*Petrus Kaerius cælavit*," and a few are dated 1599, e.g., Warwickshire and Leicestershire, Radnorshire, etc., and a map of part of Scotland. Although the maps are not all signed, and a few only are dated, they are uniform in dimensions and character,

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and there can be no doubt but that the whole series was engraved by Keer in 1599; I can, however, find no earlier impression of any of these maps than those in Regnerus Vitellius' epitome.

Keer's name does not appear in Ortelius' list of engravers and cartographers; he was, nevertheless, a prolific artist, and his maps are both numerous and of good clear workmanship. His designs are bold and incisive, and are easily recognized in the various collections in which they occur. The only copies of this epitome of Camden which I have seen are those in the British Museum, the *Bibliothèque nationale* (one copy each), and the collection of Mr. Alexander Peckover.

1620 (?). Speed, John. 4⅛ × 3⅛. Scale, 8 miles = 1 inch. Engraved by Peter Keer [1599].

This is a reprint of the map described under the date 1617 (Camden), the title of the map only having been altered from Latin to English. It now reads "Hartforde Shire." This map is also distinguishable from the earlier impression by the omission of the printer's mark "Q. 3," the insertion of the number 19 in the right bottom corner, and the absence of letterpress on the back. The above date is taken from the British Museum Catalogue, where it is given as doubtful, and I am not aware upon what authority it is based.

From 'England Wales Scotland and Ireland Described and Abridged with ye Historie Relation of things worthy memory from a farr larger Voulume Done by John Speed.' *Anno Cum privilegio* [1620]. And are to bee sould by Georg Humble at ye Whit horse in pope's head Alley. This title is upon an ornamental title-page bearing two armed figures, described as "A Dane" (on the right) and "A Norman" (on the left), with a shield between them, and above it cherubs with small armorial shields. The date, which occurs at the foot in subsequent editions, is, unfortunately, cut off in the copy in the British Museum, but an examination of the type used, and a comparison with that in the other editions known to me, shows that it is of a different edition from any other. The title-page is of the same design as in the copy of 1627; while in the copies of 1666 and 1676 alterations have been made. The only thing which can be said certainly on the subject is that this edition is earlier than 1666 and is not one of 1627. The volume is obl. 12mo. The text is abridged from that of the 'Theatre of the Empire of Great Britaine.' London, 1611, folio (*ante*).

(Reprinted 1627, 1666, and 1676.)

1626. Camden, William. 4⅛ × 3⅜. Scale, 8 miles = 1 inch.

Very like Peter Keer's map of 1599, and contains the same details, but spellings of names differ. Shows rivers, with bridges, towns and villages, trees and hills. Outside plain double-lined border, "North," "East," "South," "West." On left, degrees and minutes of North latitude, 52° through Hitchin. Along bottom,

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degrees and minutes of East longitude, Dunstable being about 20° east. In left top corner, in panel, "Hartford Shire"; in left bottom corner, "A Scal (*sic*) of Miles." On back English text with description of Buckinghamshire.

This map is from 'The abridgment of Camden's Britānia with The Maps of the severall Shires of England and Wales.' Printed by John Bill, Printer to the King's most exellent Maiestie, 1626. London, obl. 12mo. It contains 52 county maps. They are uniform in size, and are printed in the middle of an oblong page. These maps vary a little in style, and may have been engraved by different artists, but they seem to have been copied very closely in design from those of Keer.

***1627. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

This map of Herts is an identical impression with that of 1611, and has the same imprint. On the back is the text of chap. xx of the 'Theatre' of 1611, with the same scroll-heading. The initial letter H of the text differs, however, slightly from that of 1611. It is of much the same size and design, with the same figure, but the border is a plain, unornamented double line. The type of the letterpress is also slightly different from that in the first edition.

From the third edition of the 'Theatre,' London, 1627–31, folio. The title-page is that of the first and second editions, redated, but with the imprint "Are to be sold by George Humble at the Whit horse in Popes-head Alley." The second, third, and fourth books are dated 1631. This edition of the 'Theatre' is in one volume with 'A Prospect of the most famous parts of the World . . . . together With all the Provinces, Counties, and Shires, contained in that large Theator of Great Brittaine's Empire. Performed by John Speed,' which is dated London, 1631.

***1627. Speed, John.** 4⅛ × 3$_{16}^{5}$. Scale, 8 miles = 1 inch. Engraved by Peter Keer [1599].

A reprint of the map in the 1620 edition of the abridgment of the 'Theatre.'

From 'England . . . . Described and Abridged,' by John Speed, London, 1627, obl. 12mo. The title-page in this copy is dated at foot "*Anno Cum privilegio* 1627." Its design is identical with that of the title-page ascribed to 1620. In the letterpress the type differs slightly from that of 1620, though the matter and arrangement are the same.

1635. Simons, Mathew. Thumb-nail map in corner of plate, about 1½ inches square. Scale, about 40 miles = 1 inch. Engraved by Jacob van Langeren.

Part of an engraved plate 4 inches square, containing on left a triangular table of distances of "Hartforde shire, wth some cōfining Towns," giving 26 names of towns arranged along the top and left-hand side, and, in the right-hand bottom corner,

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a skeleton map of the county, with lines indicating the points of the compass radiating from its borders. The principal towns are indicated on the map by capital letters, and the river Lea, with some of its tributaries, is shown. At the top of the map "Cambridgshire North," on the left "Bedfo: and Buckin: W.," on the right "Essex East," and at foot "Middelsex South"; in the right-hand bottom corner, open compasses standing on a scale of (10) miles. In the centre of the bottom marginal line of the plate the number 17. This is reproduced in facsimile (Plate VI).

From a small quarto book of 42 engraved plates, all, except the frontispiece, 4 inches square, consisting of a title-page, frontispiece, two plates of instructions, and 38 tables of distances and maps of the English counties. The frontispiece is a little circular map of England and Wales, 3½ inches in diameter, nearly. It has the following inscription running round the margin: "*Angliæ Descriptio in Qua Comitatuum et Præcipuarum civitatum Locus et Paroeciarum numerus oculis inspiciendus Exhibetur*," and on the face of the map itself "*H. W. Exc. W. Kip scul.*" It is reproduced as the frontispiece to this Catalogue (Plate I).

The engraved title to the work runs as follows:—"A Direction for the English Traviller. By which he Shal be inabled to Coast about all England and Wales. And also to know how farre any Market or noteable Towne in any Shire lyeth one from an other, and Whether the same be East, West, North, or South from ye Shire Towne. As also the distance betweene London and any other Shire or great towne: with the scituation thereof East, West, North, or South from London. By the help also of this worke one may know (in what Parish, Village, or Mansion house soever he be in) What Shires he is to passe thorough and which way he is to travell till he come to his Journies End. Infælix cuius nulli Sapientia prodest. Are to be Sold by Mathew Simons at the golden Lion in Ducke laine, A° 1635. Jacob van Langeren sculp."

The Tables of Distances are copied from those in John Norden's 'Intended Guyde, For English Travailers.' London, 1625. 4to. The only copy of this edition which I have seen is one in the British Museum.

(Reprinted 1636.)

***1636. Simons, Mathew.** Thumb-nail map in corner of plate, about 1½ inches square. Scale, about 40 miles = 1 inch. Engraved by Jacob van Langeren.

This is another impression of the edition of 1635, but dated 1636. There is a copy in the British Museum and one in the Bodleian Library. The British Museum copy contains a plate of Yorkshire 8 inches square, in addition to the plates in the copy of 1635.

***1637. Norden, John.** 9$\frac{9}{16}$ × 7$\frac{11}{16}$. Scale, about 4 miles = 1 inch. Engraved by William Kip.

I have not been able to find any copy of this edition. The only trace is a mutilated title-page dated 1637, which appears to belong

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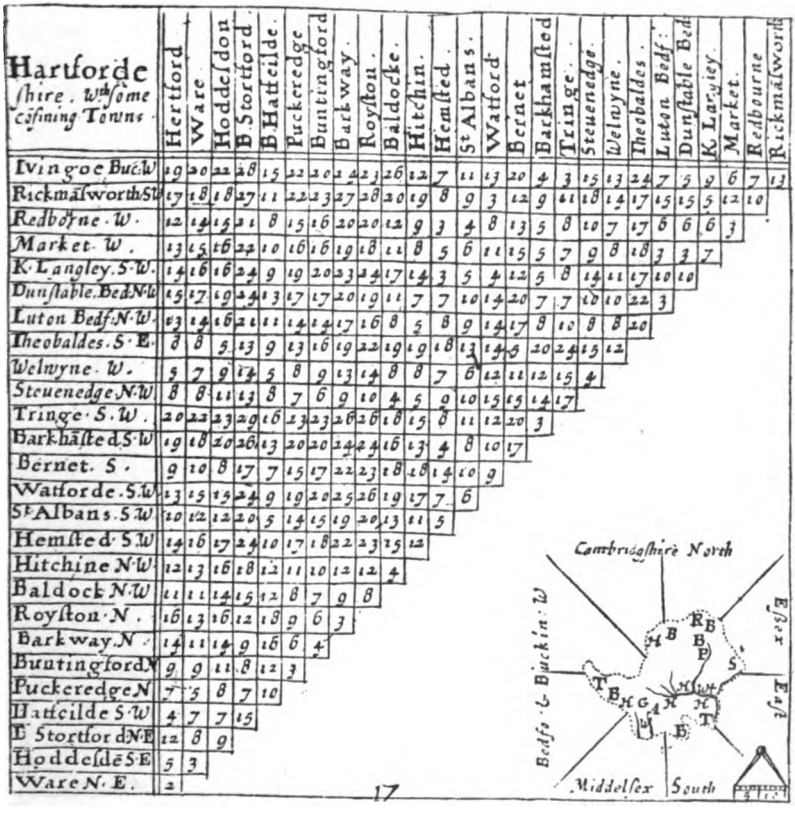

THUMB-NAIL MAP OF HERTFORDSHIRE WITH TABLE OF DISTANCES.

From 'A Direction for the English Traviller,' Jacob van Langeren, 1635.

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to this work, in the Gough Collection in the Bodleian Library. This reprint is referred to in Gough's 'Anecdotes of British Topography' (1768), p. 196.

*** 1637. Camden, William.** 14 × 11¼. Scale, 2½ miles = 1 inch. Engraved by William Kip, after Norden.

A reprint of the map in the folio editions of Camden's '*Britannia*' of 1607 and 1610, but distinguishable by a plate number 16 in the left-hand bottom corner.

From Camden's '*Britannia*,' Philemon Holland's English translation, the second (and last) edition, London, 1637, folio. The imprint on the title-page of this edition is, "London, Printed by F. K. R. Y. and I. L. for Joyce Norton, and Richard Whitaker ["for Andrew Heb," in the British Museum copy], 1637."

1643. Jenner, Thomas. Map filling triangular space about 3 × 3. Scale, about 20 miles = 1 inch.

Part of an engraved plate 4 inches square, as used in Simons' publication of 1635 and 1636 (q.v.), but with the map in those editions erased, and replaced by a triangular map showing the boundaries of the county, with towns and rivers, and the country round, including Ely on the north, Oxford on the west, and London on the south. In the left-hand bottom corner a pair of compasses standing open on a scale of (10) miles. The number 17 in bottom margin of the plate. The Table of Distances has one figure added in each column.

This map is from another edition of the 'Direction for the English Traviller,' with the imprint on the title-page, "Are to be sold by Thomas Jenner at the south entrance of the Exchange, 1643." London. 4to.

(There is a reprint of this edition by John Garrett, of which I have a copy, and there is one also in the Bodleian Library, both being in 16mo, without date. In this impression the title-page has been altered, and the following inserted: "Printed and are to be sold By John Garrett, at the south Entrance of y^e^ Royall Exchange in Corn-hill, where you may have a most exact Mapp of England with the small Townes described in six large Sheets, also all other large Mapps of y^e^ World or any other part thereof.")

*** 1645. Saxton, Christopher.** 20 × 15¾. Scale, about 2 miles = 1 inch. Engraved by Nicholas Reynolds of London [1577, redated 1642].

This is an unaltered reprint from the original plate, with the date 1642 inserted in the title in lieu of 1577.

From 'The Maps of All the Shires in England and Wales. Exactly taken and truly Described by Christopher Saxton. And graven at the Charges of a private Gentleman for the publicke good. Now newly Revised, Amended, and Reprinted. Printed for William Web at the Globe in Cornehill, 1645.'

The engraved title-page is taken from the '*Expeditionis Hispanorum in Angliam vera descriptio*' (1588) of Adams and

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Ryther, with the above pasted in. The maps seem generally quite unaltered, except that the date is changed, and that, in some cases, an English title is inserted. The only copy I have seen is one in the University Library, Cambridge.

*** 1646. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

An unaltered impression of the map of 1611, with the same imprint. Latin text on back; no scroll-heading to the chapter. The initial H contains a figure of St. Nicholas with a dotted border to the design. My notes do not enable me to distinguish the text and ornamentation on the back of this map from those on the map of 1616. Any difference which may exist would be very slight.

From the '*Theatrum imperii magnæ Britanniæ. . . . . A Joanne Spedo Anglice, conscriptum et à Philemone Hollando latinitate Donatum.*' *Amstelodami, Apud Johannem Blaeu.* cIↃ IↃCXLVI (1646), folio. The second (and last) edition of Holland's translation into Latin of the 1616 edition of Speed's 'Theatre,' with a slightly different title. A copy in the Bodleian Library is the only one I have come across.

1646. Janssonius, Joannes. 22 × 17. Scale, about 2 miles = 1 inch.

A plain map of Middlesex and Herts together, with north to right, showing hundreds, rivers, towns and villages, parks, churches, beacons, and hills. In left top corner Royal Arms with supporters. In left bottom corner pediment with cherub supporting emblazoned and crowned shield, resting on tablet with inscription "Roger Erle of Clare and Hartford." On face of pediment two shields crowned: that on right blank; that on left emblazoned, with tablet below inscribed "Edward Seimour Erle of Hartford." In right top corner escutcheon bearing '*Middelsexiæ cum Hertfordiæ comitatu*: Midlesex and Hertford Shire,' supported by agricultural figures and animals on either side. Resting on bottom border in centre, scale of miles and figures with sheep, oxen, and sheaves of corn, inscribed "*Quatuor milliaria Anglica conficiunt unum milliare Germanicum.*" On the bottom margin to the left "*Amstelodami, Apud Joannem Janssonium.*"

This map is from the '*Novus Atlas, sive Theatrum orbis Terrarum: In quo Tabulæ et Descriptiones omnium Regionum totius universi accuratissime exhibentur in Quatuor Tomos Distinctus.*' *Amstelodami, apud Joannem Janssonium. Anno* cIↃ IↃCXLVII (1647), large folio. It is found in the fourth tome, which is dated 1646, and contains the Latin text of Camden's '*Britannia*,' in double columns, with maps of the English counties, the text on the back of the map of Middlesex and Herts being paged 167 and 168.

This Atlas was reproduced in various languages, and at various dates under the above title, some editions being in a larger number of volumes or parts than others. Another Latin edition, in five

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tomes, and a sixth added, dated variously, is in the University Library, Cambridge, with Middlesex and Herts in tome iv, dated also 1646. The first tome is dated, however, 1656, and the fifth, 1657; the sixth, or additional, tome has no date. It was reproduced in an abridgment in two volumes folio in 1666 by Jansson's heirs under the title '*Atlas Contractus*' (q.v., p. 30), with the same map of Middlesex and Herts.

The following are the dates of the volumes containing the map of Middlesex and Herts in the various editions of the '*Novus Atlas*' which I have seen: 1646 (Latin) and 1646 (French), 1647 and 1649 (German), 1652 (French) and 1652 (Dutch), 1658 (Latin). There may be others.

Another issue of the map, unaltered except for the addition of meridian lines, and of the imprint "*Apud G. Valk et P. Schenk*" in lieu of that of Jansson, is in Mr. Lewis Evans' collection, but I have not been able to find it elsewhere. It is, of course, subsequent to 1666, as the plate of this date is unaltered. It is probably from an atlas of 1683.

*** 1646. Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

Another impression of the map of Middlesex and Herts of this date. French text of Camden's '*Britannia*' in double columns on back, pp. 187, 188.

From a French edition of the '*Novus Atlas*,' tome iv, Amsterdam, 1646, large folio.

Title: '*Le Nouvel Atlas ou Theatre du Monde, Auquel est representée la Grande Bretagne, Contenant les Royaumes d'Angleterre, d'Escosse et d'Irlande.*' *Par Jean Jansson. Tome Quatrieme.*

*** 1647. Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

An unaltered impression of the map of Middlesex and Herts of 1646. German text of Camden's '*Britannia*,' pp. 217, 218, in double columns, on back.

From the fifth volume (dated 1647) of a German edition of the '*Novus Atlas*' in six tomes, of which the first is dated 1658. Amsterdam, 1658, etc., large folio.

1648. Blaeu, Johannes. 20 × 15¼. Scale, 2¼ miles = 1 inch.

This is a delicately engraved and artistic map, showing the hundreds, rivers (with bridges), towns and villages, parks, woods, hills, and beacons. The hilly and wooded districts are well delineated with the hills shaded and groups of trees and underwood. In the left-hand top corner is an oval, scrolled panel supported by figures, with two cherubs above, and title "*Hertfordia comitatus, vernacule Hertfordshire.*" In left bottom corner is a heavy column; on face two coats of arms crowned; in panel below upper shield "Roger Erle of Clare and Hartford." On base of column, below lower shield, "Edward Seinour (*sic*) Earle of Hertford." On right face of column two blank shields. In right top corner Royal

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Coat of Arms with pennons bearing crosses of St. George and St. Andrew.* In right bottom corner group of three soldiers, one seated and drawing on scroll, and below, scale of miles and "*Milliaria Anglica quorum quatuor unum Germanicum.*"

This map is from the '*Theatrum Orbis Terrarum sive Atlas Novus . . . .*' *Amstelodami. Apud Guilielmum et Johannem Blaeu. Anno* cIↃ IↃcxxxviii (1638), large folio, published in a series of volumes dated successively. Great Britain is printed, with the text of Camden's '*Britannia,*' in the fourth part, *Amstelodami. Apud Johannem Blaeu,* cIↃ IↃcxlviii (1648).

It is difficult to assign dates to the various editions of this great work, and to the subsequent editions published under the title '*Geographia, quæ est Cosmographiæ Blavianæ Pars Prima,*' etc., more shortly denominated the '*Atlas Major*' (q.v., *post*, p. 28). The first appeared in Latin, French, and Dutch only (at least, I have not seen copies in any other languages), the second in Latin, French, Dutch, and Spanish, and in its later and more complete form in editions of nine (Dutch), ten (Spanish), eleven (Latin), and twelve (French) large folio volumes.

This work was commenced by William Blaeu, but as he died in 1634, the publication must have been principally carried through by his sons Johannes and Cornelis, the name of the former generally appearing alone on the title-page. A primary difficulty in fixing the dates of the various editions arises through the practice of adopting for all editions the original engraved title-page with the Latin imprint and the date 1638, etc., at foot, with a title in the language of the particular edition, but undated, pasted in.

A French edition in the Inner Temple Library has the following title: '*Le Theatre du Monde ou Nouvel Atlas contenant Les Chartes et Descriptions De tous les Païs de la terre Mis en lumiere, Par Guillaume et Jean Blaeu,*' and below the Latin imprint and the date 1638. The fourth part of this edition contains Great Britain, and is dated 1648, with an address to the reader by *Johan Blaeu,* dated 1st October, 1645, and a dedication to "*Henriette-Marie, Reyne de la Grande Bretagne, France, et Yrlande.*" The text is that of Camden's '*Britannia,*' and there are 63 maps in the volume. In a Dutch edition, in seven volumes, in the British Museum, as well as in a copy in the Library of the Royal Geographical Society, Great Britain is found in the fourth volume, with the date 1648 (preface dated 12th November, 1647). William Blaeu had published previously, in 1631, an Appendix to the '*Theatrum*' of Ortelius and Mercator, but I have seen only one volume (in the University Library, Cambridge), and this does not contain any maps of Great Britain. There is also, in the *Bibliothèque nationale,* in Paris, a single volume (the ninth) of the '*Géographie Blaviane,*' which is dated Amsterdam, 1640.

It may therefore be that in assigning 1648 as the earliest date of the publication of Blaeu's map of Herts I am on rather

* Reproduced in facsimile as the tailpiece on p. 32.

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doubtful ground, but in the somewhat laborious research I have undertaken in attempting to bring into order out of the material available the various editions of the Atlases of the Blaeus, I have not been able to arrive with certainty at any earlier date.

In all the subsequent impressions the map is found quite unaltered from its original state. Some of those which appear under the title of the '*Theatrum*' or '*Novus Atlas*,' with the text of Camden, may be later than 1648. There is a reprint in the following year (*post*), and there are several reprints under the title '*Atlas magnus*' (q.v., 1662, etc.).

*** 1649. Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

Another unaltered impression of the map of Middlesex and Herts of 1646. German text of Camden's '*Britannia*,' pp. 217, 218, in double columns, on back.

From the fourth volume of a German edition of the '*Novus Atlas*' in four tomes, Amsterdam, 1649, large folio.

The text and pagination of this volume are the same as those of the fourth tome of the edition of 1658, which is dated 1647 (see *ante*, p. 23).

*** 1649. Blaeu, Johannes.** 20 × 15¼. Scale, 2¼ miles = 1 inch.

An unaltered reprint of the map of Blaeu's '*Theatrum*' of 1648. No text on back.

From one of two large folio volumes in the British Museum, with the title of the '*Theatrum*,' and containing maps of the English counties without any descriptive letterpress.

*** 1650. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

An unaltered print of the map of 1611, except for the erasure of the old imprint and the insertion of that of the Reas—"are to be sold by Roger Rea the Elder and Younger at the Golden Cross in Cornhill agat: y^e^ Exchange."

On back scroll-heading, with blank *oval* centre. Initial letter H plain, with shaded leaf decoration, differs from other editions.

From Speed's 'Theatre.' The third edition, bound, in the British Museum, with the 'Prospect' of 1662. London, folio, 1650.

*** 1652. Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

Another copy of the map of Middlesex and Herts of 1646. Dutch text of Camden's '*Britannia*' on back in German type.

From a Dutch edition of the '*Novus Atlas*,' Amsterdam, large folio, 1652.

*** 1652 (?). Saxton, Christopher.** 20 × 15¾. Scale, about 2 miles = 1 inch. Engraved by Nicholas Reynolds of London [1577].

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Probably an original and not a reprint (see Stent, Peter, p. 28).

In the Gough Collection in the Bodleian Library is a volume of Saxton's maps with the insertion of a map of England—"*Christo . . . phorus . . . Saxton Describebat:* London, printed and sould by P. Stent at the White horse in guilt spur streete without Newgate, 1652. *Petrus Kaerius cælavit*"—and a second map of England dated also *anno* 1652. This is, apparently, an original and complete copy of Saxton, and contains Hertfordshire. It is perhaps a single copy of the original made up with the additional maps.

*** 1652 (?). Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

The map of Middlesex and Herts, reprinted after that of 1646.

From a French edition of the '*Novus Atlas*,' in five tomes, of which the title runs—'*Nouvel Atlas, ou Theatre du Monde, Comprenant Les Tables et Descriptions de toutes les Regions du Monde Universel.*' The title bears the Latin imprint, and is dated, in tome i, 1656. In the only copy I have seen of this atlas, that in the University Library, Cambridge, the fourth tome is dated (with the Latin title) 1652, and contains maps without text, mostly by Jansson, but some by Blaeu, Herts being amongst these latter, but it seems probable that this was originally a complete work by Jansson, with his map of Middlesex and Herts.

*** 1657. Jenner, Thomas.** Map filling triangular space about 3 × 3. Scale, about 20 miles = 1 inch.

A reprint of the map in Jenner's 'Direction for the English Traviller' of 1643 (q.v.), but with letterpress list of places in three columns below and on back. At top of page "Hartfordshire," and page 71. It is distinguishable from the impression in the edition of the 'Book of the Names' of 1677 by the pagination.

This is from a thin quarto volume in which the plates of the 'Direction' of 1643 are used with a new title, explanation of the Tables, and a list of places in each county. The title is 'A Book of the Names of all Parishes, Market Towns, Villages, Hamblets, and smallest Places, in England and Wales . . . .' London: Printed by M. S. for Thos. Jenner. At the South entrance of the Royall Exchange, 1657.

(Reprinted in 1662, 1668, and 1677.)

1657 (?). Speed, John. 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Probably an unaltered impression of the map of 1611.

In the Douce Collection in the Bodleian Library is a page from a bookseller's catalogue in which the English editions of Speed's 'Theatre' are given as 1611, 1614, 1627, and 1657, but I have never seen a copy of the last-mentioned date. I have, however, a copy of Speed's map of Herts, which differs in respect to the text and ornamentation on the back from the map in any edition I have seen. It might belong to that of 1614, but it seems a late impression and the plate is worn, which points to a period

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approximate to 1657. The point must, at present, be left a very doubtful one.

*** 1658. Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

A further unaltered impression of the map of Middlesex and Herts of 1646. Latin text of Camden's '*Britannia*' on back, pp. 167, 168.

From the '*Novus Atlas*' (Latin edition), tome iv, Amsterdam, 1658, large folio. Tome i is dated 1659. This seems to be a reprint of the first Latin edition of the Atlas, 1846–47 (q.v.).

*** 1662. Jenner, Thomas.** Map filling triangular space about 3 × 3. Scale, about 20 miles = 1 inch.

A reprint of the map and letterpress in the 'Book of the Names' of 1657. The map is also paged 71.

From a reprint of the 'Book of the Names' of 1657. London, 1662. 4to. The only copy of this edition I have seen is that which belonged to Samuel Pepys, and is now in the Pepysian Library at Magdalen College, Cambridge.

*** 1662. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Another unaltered impression of the map of 1611, except for the erasure of the previous imprints and the insertion of that of Bassett and Chiswell, "to be sold by Thomas Bassett in Fleet Street and Richard Chiswell in St. Paul's Churchyard." No text on back.

This appears to be from an atlas of Speed's maps without letterpress, but I have not seen a copy. Many individual maps of English and Welsh counties exist, however, with the date 1662.

*** 1662. Blaeu, Johannes.** 20 = 15¼. Scale, 2¼ miles = 1 inch.

A reprint, unaltered, of the map by Blaeu in his '*Theatrum*' of 1638–48.

It occurs, indexed under Camden, in the *Bibliothèque nationale*, Paris, in a large folio volume containing the text of Camden's '*Britannia*' in French. The map of Herts has pp. 161, 162 of the text on the back, in double columns.

The title is '*Description Generale d'Angleterre.*' *Amstelodami. Apud Johannem Blaeu.* cIↃ IↃC LXII (1662). The dedication to Queen Henrietta Maria and the address to the reader, which occur in the '*Theatrum Orbis Terrarum sive Atlas Novus*' of William and John Blaeu of 1638–48, tome iv, and are there dated 1st October, 1645, are reproduced in this volume with the date 1st January, 1662.

*** 1662. Blaeu, Johannes.** 20 × 15¼. Scale, 2¼ miles = 1 inch.

A reprint of the map of Herts in the '*Theatrum*' of 1638, etc. Text of Camden's '*Britannia*' on back.

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From the '*Geographia, quæ est Cosmographiæ Blavianæ, qua Orbis Terræ Tabulis ante oculos ponitur, et Descriptionibus Illustrator.*' *Amstelædami, Labore et Sumptibus Joannis Blaeu,* MDCLXV (1665), published in eleven tomes, all of which, except the first, are dated 1662, the dedication of the first volume being itself dated 9th June, 1662. This is a Latin edition of Blaeu's 'Atlas Major,' and apparently the first under this title, although, as mentioned at p. 25, there is a volume of 1640 for which the same title is used, and which may represent a full and earlier edition. England, with the county maps and the text of Camden (Latin), fills the fifth volume, with the title '*Geographiæ Blavianæ Volumen Quintum, quo Anglia, quæ est Europæ Liber undecimus, continetur*' *Amstelædami, Labore et Sumptibus Joannis Blaeu,* MDCLXII (1662). The Latin text of Camden is in double columns, pp. 187 and 188 on the back of the map of Hertfordshire. There are French editions in twelve volumes of 1663 and 1667 of this work, one in Spanish in ten volumes, with the original date of the Latin edition on the title-pages, and a Dutch edition ascribed to 1664–5 in the British Museum Catalogue, all of which contain the same map of Herts unaltered.

*** 1663. Blaeu, Johannes.** 20 × 15¼. Scale, 2¼ miles = 1 inch.

Blaeu's map of Herts unaltered from the earlier impressions. French text of Camden on back, pp. 161, 162.

England, with the text of Camden and the county maps, forms the fifth volume of this edition of the '*Géographie Blaviane,*' in twelve volumes, large folio. *Amsterdam, chez Jean Blaeu,* M.DC.LXIII (1663). This volume, like the fourth part of the '*Theatre*' of 1648, is dedicated to Queen Henrietta Maria. It contains an address to the reader which occurs, with some variation, also in the latter volume.

*** 1664 (?). Blaeu, Johannes.** 20 × 15¼. Scale, 2¼ miles = 1 inch.

Reprint of Blaeu's map of Herts in his '*Theatrum.*' Dutch text of Camden's '*Britannia,*' in double columns, pp. 177, 178, on back.

This is from a Dutch edition of the '*Geographia Blaviana*' of Blaeu, in nine volumes, with the title '*Grooten Atlas,*' large folio, 1664–5.

1665 (?). Stent, Peter. 19⅛ × 15⅜. Scale, about 2 miles = 1 inch.

A coarsely-printed map like that of Saxton, which may even have been worked from Saxton's plate very much altered. It shows the boundaries of the county and hundreds, the rivers (with bridges), and roads (indicated by a double, dotted line), towns, villages, hamlets and principal houses, hills, parks, woods, and beacons. The hundreds are distinguished by capital letters referring to a table in the margin. In the margin "*Septentrio,*"

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"*Oriens*," "*Meridies*," and "*Occidens*." At "Barnett field" a group of foot-soldiers fighting; another group north of St. Albans with the legend "Battayle of S^t^ Albons"; and another west of "Kempton," "A Battle where the Danes were over throwne."

In the left-hand top corner, a square panel with scrolled border, containing title, viz., '*Hartfordiæ Comitatus nova descriptio, continens in se oppida mercatoria* XVIII, *ecclesiasque parochiales* CCVIII.' In left bottom corner, an open pair of compasses standing on a scale of 7 miles. and "*Scala milliarium*." In rectangular panel in the right-hand top corner, "*Nomina Hundredorum in hoc Comitatu*. A. Odsey Hundred. B. Edwinstree Hundred. C. Hitchin half Hundred. D Brodwater Hundred. E. Braghing Hundred. F. Hartford Hundred. G. Dacorum Hundred. H. Caisho Hundred." In right bottom corner, in square panel, with pictorial signs as used on the map:

"*Notarum Explicatio.*

LAT.	ANG.
Oppida Mercatoria	Markett Townes
Castella	Castells
Ædes et Palatia Elizabethæ	Houses et manners of Q. Elizab:
Abbatiæ	Abbeys
Ecclesiæ Parochiales	Parish Churches
Nobilium ædes	Gentlemen's howses
Villæ	Villages
Molæ	Milles";

and below, "Printed and sould by P. Stent."

Along the bottom margin, in one broken line, "Sould by . . . John Overton at the . . . white horse without Newgate . . . neare the fountaine tavern."

There is no direct evidence to fix the date of this map, as I have only seen it in the collections of Mr. Greg and Mr. Lewis Evans. In a copy of Saxton's Atlas in the Inner Temple Library is interpolated a map of England described and dated as follows: "A new map of the Kingdome of England and Principality of Wales, taken out of I.S. Printed and are to be sold by Peter Stent at the White Horse in Giltspur Stret without Newgate, 1665," which might very probably be taken from an atlas of that date by Stent of which the above-described map of Herts was a part.

There is a catalogue of Stent's maps and other publications, dated 1662, in the Gough Collection in the Bodleian Library, and it appears from an undated advertisement of John Overton's that he succeeded Stent in his business, although this is disputed at great length by Robert Walton in a rival advertisement in the same collection.

* **1666 (?). Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Another unaltered reprint of the map of 1611, with Bassett and Chiswell's imprint, and no text on back.

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From an atlas of Speed's maps, without letterpress. A copy in the British Museum is ascribed to 1666.

*** 1666. Janssonius, Joannes.** 22 × 17. Scale, about 2 miles = 1 inch.

An unaltered impression of the map of Middlesex and Herts of 1646, in the '*Novus Atlas*.' This map has the Latin text of the description of Middlesex on the back, in double columns (not paged).

From the first volume of the '*Atlas Contractus sive Atlantis majoris compendium: In quo Totum Universum Velut in Theatro*,' etc. *Amstelodami, Apud Joannis Janssonii p.m. Hæredes, Anno* M.DC.LXVI. 2 vols., large folio. Both volumes are misdated on the first title-page MDLXVI, but the correct date is appended to the full title and to the dedication of the first volume (June, 1666).

*** 1666. Speed, John.** 4⅛ × 3⅛. Scale, 8 miles = 1 inch. Engraved by Peter Keer [1599].

A further reprint of the map in the 1620 edition of the abridgment of the 'Theatre.'

From 'England . . . Described and Abridged . . ,' by John Speed, London, 1666, obl. 12mo. The engraved title-page in this edition is like that in the copies of 1620 and 1627, but the plate has, apparently, been re-worked, and the letterpress in the left-hand bottom corner cut out. The date 1666 is inserted. The impressions of the maps in this edition are not so good as those in the earlier ones. A sub-title, 'A Prospect . . . . ' has at foot, "London, Printed for Roger Rea, at the Gilded Cross in Winchester-street near Gresham-colledge. 1668."

*** 1667. Blaeu, Johannes.** 20 × 15¼. Scale, 2¼ miles = 1 inch.

Another unaltered reprint of Blaeu's map of Herts. French text of Camden, pp. 161, 162 on back.

This seems to be a reprint of the French edition of 1663, in 12 vols. Large folio. 1667.

*** 1668. Jenner, Thomas.** Map filling triangular space about 3 × 3. Scale, about 20 miles = 1 inch.

Another reprint of the map in the 'Book of the Names' of 1657.

From a reprint of the 'Book of the Names,' redated 1668, London, 4to.

1670 (c). Blome, Richard. 8¼ × 5¾. Scale, 6 miles = 1 inch. Engraved by Wenceslaus Hollar.

For full description and notes on this map, see Thomas Taylor, 1671, *post*, p. 31.

A copy in Mr. Lewis Evans' collection may, it seems probable, be a first impression of this map, as it has not the number 17 which occurs on the map in Taylor's Atlas, nor are the roads inserted as in an impression later than Taylor's. In the panel left blank in the map in Taylor's Atlas is the dedication, "To the Worshipfull Coll. Sylas Titus of Bushye, Esqr. This Mapp is humbly DD by R. B."

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(Reprinted about 1671 and at some later date, which I am unable to fix.)

1671 (?). Taylor, Thomas. 8¼ × 5¾. Scale, 6 miles = 1 inch. Engraved by Wenceslaus Hollar [1670 or 1671].

Shows hundreds (indicated by numbers referring to list in margin), rivers, towns, villages, houses, woods, and hills. A well-filled and artistic map.

In left top corner, on a cloth suspended on three nails at the corners and in the middle of the top, "A Mapp of the County of Hartfordshire with its hundreds," and two lines erased of which the top one reads "By Rich. Blome." To the right and slightly below, a circular indicator of the north. In the left-hand bottom corner a rectangular upright panel in two compartments; in the top compartment a list of the hundreds numbered 1 to 8. The bottom panel is plain, and evidently there has been a large erasure. Against the foot of the panel on the map, "*W. Hollar fecit.*" In right bottom corner a scale of miles. This map is numbered 17 in the right-hand top corner.

From 'England Exactly Described Or a Guide to Travellers In a Compleat Sett of Mapps of all the County's (*sic*) of England; being a Map, for each County where every Town and Village in each County is Perticulerly (*sic*) Expressed with the Names and Limits of every Hundred Etc. Very Usefull for all Gentlemen and Travellers being made fitt for the Pockett; Printed Coloured and Sold by Tho: Taylor at y^e^ Golden Lyon in Fleet-street where are sold all Sorts of Mapps and fine French Dutch and Italian Prints.'

There are 41 maps, numbered consecutively, in this work. They are variously dated from 1667 to 1671, many of them being "printed for Ric. Blome," and engraved by Hollar.

According to Gough's 'Anecdotes of British Topography' Hollar engraved a smaller map of Herts in 1670,* and this map published by Taylor seems to be a reprint with an original dedication erased and the number 17 added.

There is a subsequent impression, of which a copy exists in Mr. Evans' collection, in which the Old North Road from Enfield to Royston, with branches from Hoddesdon to Hertford and from Puckeridge to Cambridge, and the Great North Road from Barnet to Baldock and beyond, with a branch to St. Albans, bifurcating thence to Dunstable and Luton, are inserted.

1673. Blome, Richard. 13 × 10. Scale, 3 miles = 1 inch.

A very poorly drawn and sketchy map, showing hundreds, rivers, towns, villages (with churches), beacons, parks, woods, and hills. In left top corner escutcheon with crowned and supported coat of arms, and below, "To the Rt. Honeble James Cecill, Earle of Salisbury, Visct. Cranborne, Ld. Cecill of Essendon Etc. This Mapp is Humble Dedicated by Ric Blome." In right top corner,

* 'Anecdotes,' London, 1768, 4to, at p. 208.

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"A Mapp of Hartfordshire with its Hundreds By Ric Blome." In the left-hand bottom corner, "A scale of 6 miles."

From 'Britannia: or, a Geographical Description of the Kingdoms of England, Scotland, and Ireland . . . . Illustrated with a Map of each County of England, besides several General ones.' London, 1673, folio. It is dedicated to Charles II, and contains a map of London before the Fire by W. Hollar. The author says in his preface that the maps are taken from Speed—his maps being the best then extant—and that he does not pretend to a new Survey. Gough, in his 'Anecdotes of British Topography' (1768), p. 24, calls this work "a most notorious piece of plagiarism." In general it is a very poor and badly engraved reproduction of the older maps. The general map of "The Isles of Great Brittaine," drawn by Sanson, and dated London, 1669, is based on the meridian of the Azores.

Eight hundred and twelve coats of arms of the "Benefactors and Promoters of the worke" are printed at the beginning of the volume, in 24 sheets, and at the end there are lists of the "Nobility and Gentry, which are (or lately were) related unto the several Counties of England and Wales," which runs to 120 pages, and this latter the author refers to in his preface as the only original matter in the volume.

[Blaeu, 1648.]

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AND

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EDITED BY JOHN HOPKINSON, F.L.S., F.G.S.,
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CONTENTS :

	PAGE
Report on the Rainfall in Hertfordshire in the Year 1900. By John Hopkinson, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.	33
Notes on Lepidoptera observed in Hertfordshire in the Year 1900. By A. E. Gibbs, F.L.S., F.R.H.S.	43
Note on the Appearance of a Foreign Beetle (*Diaxenes dendrobii*) at Watford. By A. Stawel-Stovel	46
Notes on Birds observed in Hertfordshire during the Year 1900. By Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U.	47
Report on Phenological Phenomena observed in Hertfordshire during the Year 1900. By Edward Mawley, Sec. R. Met Soc., F.R.H.S.	57
Ostracoda from the *Chara*-Marl of Hitchin. By Frederick Chapman, A.L.S., F.R.M.S.	60
Further Note on the Palæolithic Deposits at Hitchin. By Clement Reid, F.R.S., F.L.S., F.G.S.	63

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HERTFORDSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.

The objects of the Society are:—1. The investigation of the Meteorology, Geology, Botany, Zoology, Ethnology, Pre-Norman Archæology, and Topography of the County of Hertford. 2. The publication of the results of such investigation made by its Members. 3. The dissemination amongst its Members of information on Physics and Biology. 4. The formation of a Library of works on Natural History, and of a Museum illustrative of the Geology, Botany, and Zoology of the County (the Vertebrata excepted). 5. The discouragement of the practice of removing rare plants from the localities of which they are characteristic, and of exterminating rare birds, fish, and other animals.

Evening meetings of the Society are held in the rooms of the Watford Urban District Council (Upton House) once a month during the Winter and Spring. Evening meetings are also held occasionally at St. Albans, Hertford, and other places. Field meetings are held during the Spring and Summer in various parts of the County.

Members pay an Entrance Fee of 10*s*., and an Annual Subscription of 10*s*., for which they may, if preferred, compound by a payment of £5. Ladies are eligible for election.

Donations to the Society, and letters relating thereto, should be addressed to the Librarian, Daniel Hill, Herga, Watford. Subscriptions, etc., are payable to the Treasurer, John Weall, 38, High Street, Watford.

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Forms of proposal for Membership, and any further information, may be btained on application to either of the Honorary Secretaries—

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II.

REPORT ON THE RAINFALL IN HERTFORDSHIRE IN THE YEAR 1900.

By JOHN HOPKINSON, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

THERE are several alterations in our staff of observers for the year 1900. Three rainfall stations have been discontinued—Bancroft, Hitchin, and The Grange, St. Albans, owing to the observers having removed, and King's Langley owing to the death of the observer, Mr. Isaac Butler; there is no return from Hamels Park owing to the illness of the observer; and the returns from Chipperfield and St. Albans Road, Watford, are omitted from the principal table, the records being imperfect. Against these six losses, some of which may be only temporary, there are five additions—Preston, south of Hitchin; Bulbourne and Cowroast, former stations reinstated; the Hertfordshire County Museum, St. Albans, whence the gauge formerly at The Grange, St. Albans, was removed early in the year; and Northaw. The St. Albans record may be considered practically a continuous one, the stations being very near to each other, and there being only a few feet difference in the altitude. The gauge at Northaw is in a hitherto unrepresented district in the catchment-basin of the Lea.

The result of these alterations is that the principal table contains the records of 44 stations, being one less than in the year 1899, and the same number as in 1897. The number of daily records received is 32, being one less than that for 1899.

Particulars of the 44 rainfall stations, and the monthly and total rainfall and number of days of rain in 1900, are given in Tables I and II, pp. 35–37.

The symbols in the last column of Table I show the method by which the height of each gauge has been determined, $\overline{\uparrow}$ signifying that a series of levels has been taken to the gauge from an Ordnance bench-mark, T that the height has been ascertained approximately from the same source, L that levels have been taken to the gauge from some datum other than Ordnance mean sea-level, and B that the height has been taken by the barometer.

A supplementary table (Table III, p. 38) gives nine other records of the total rainfall in the year. Two are the records of additional gauges at Rothamsted, one is that of an additional gauge at Odsey, two are the returns from Chipperfield and St. Albans Road, Watford, omitted from the principal table, and four are from 'British Rainfall, 1900.'

The mean rainfall in the county in the year 1900 was 25·95 inches. This is 1·17 inch above the average for the decade 1890–99, and 0·20 inch below that for the 60 years 1840–99. The year may therefore be considered to have been one of about average rainfall.

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The mean number of wet days in the year was 177, being 10 more than the average for the thirty years 1870–99, and 29 more than that for the previous year. The prevailing impression that rain fell very frequently but seldom to any large amount is thus fully borne out. In the Winter months, both at the beginning and the end of the year, the rain was not only frequent but also considerable, without any very heavy falls. Thus it was peculiarly favourable for replenishing our underground supply of water.

Droughts in 1900.—Droughts—"absolute" of more than 14 days' duration, or "partial" of more than 28 days with an average of less than 0·01 inch of rain per diem—occurred in April–May, July, and Sept.-Oct. The first absolute drought was in July, at 13 stations, and lasted for 15 days, July 6–20, at one station; for 16 days, July 4–19, at one station; for 17 days, July 4–20, at one station; for 19 days, July 8–26, at one station; for 20 days, July 7–26, at seven stations; and for 23 days, July 4–26, at two stations. The second absolute drought was in September, at 10 stations, and lasted for 16 days, Sept. 8–23, at four stations, and for 22 days, Sept. 2–23, at six stations. The first partial drought was in April–May, at one station only (Datchworth Rectory), where 0·29 in. fell in the 30 days April 6 to May 5. The second partial drought was in Sept.-Oct., also at one station only (Odsey), where 0·32 in. fell in the 33 days Sept. 1 to Oct. 3. It is very rarely that a partial drought is so very close upon non-existence as these were, for neither would have been to record if 0·01 inch more of rain had fallen in each case.

Distribution of the Rainfall throughout the Year.—Of the total rainfall of 25·95 inches, 8·35 inches fell during the first quarter of the year, 4·93 inches during the second, 5·08 inches during the third, and 7·59 inches during the fourth. During the Winter of 1899–1900 (Dec. to Feb.) 9·07 inches fell, during the Spring of 1900 (March to May) 3·10 inches, during the Summer (June to Aug.) 7·02 inches, and during the Autumn (Sept. to Nov.) 5·28 inches. March and September were very dry months; April, May, and July were rather dry; June, October, and November were rather wet, the two latter months, which have a high average, being, however, drier than usual; January, August, and December were very wet; and February was excessively wet. The five dry months averaged one inch each, the seven wet months three inches each, and four of these three and a half inches each.

The difference in each month from the mean for the 60 years 1840–99 was as follows:—Jan., + 1·06 in.; Feb., + 2·64; March, — 0·87; April, — 0·53; May, — 0·90; June, + 0·56; July, — 1·21; August, + 0·70; Sept., — 1·68; Oct., — 0·70; Nov., — 0·18; Dec., + 0·94.

The absolute maximum falls in any one day in each month, and the stations recording them, were—Jan. 6, Apsley Mills, Hemel Hempstead, 1·27 in.; Feb. 13, Pendley Manor, Tring, 1·80 in.; March 18, New Barnet, 0·35 in.; April 5, Much Hadham, 0·63 in.; May 24, Great Gaddesden, 0·50 in.; June 12, Apsley Mills, 0·74 in.;

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TABLE I.—HERTFORDSHIRE RAINFALL STATIONS, 1900.

District.	STATION.	OBSERVER or AUTHORITY.	Diameter of Gauge.	Height of Gauge above Ground.		Height of Gauge above Sea-level.	
			ins.	ft.	ins.	ft.	
1.	Royston—Union Workhouse	J. W. Wesson	5	1	0	217	
,,	,, Melbourne Street	Joseph E. J. Phillips	8	0	11	201	T
,,	*Odsey	H. George Fordham	5	1	0	256	↑
2.	*Baldock—High Street	F. W. Langston Day	5	1	0	214	↑
3.	*Hitchin—Preston	R. de V. Pryor	8	2	6	480	↑
,,	,, The Firs	William Lucas	5	2	1	238	↑
,,	,, The Maples	William Hill	8	1	1	220	T
,,	* ,, High Down	Joseph Pollard	5	1	1	422	↑
4.	Tring—Pendley Manor	J. G. Williams	5	2	0	500	?
,,	,, Bulbourne	Gordon C. Thomas	5	2	3	401	
6.	Cowroast	Gordon C. Thomas	5	3	8	394	↑
,,	,, Offside Cottage	Richard Leah	5	1	6	420	
,,	*Northchurch—The Limes	F. L. Sutton	5	1	0	400	
,,	*Berkhamsted—Fairhill	W. B. Hopkins	5	1	0	548	↑
,,	* ,, Rosebank	Edward Mawley	8	1	0	401	↑
,,	* ,, Rose Cottage	W. E. Milner	5	1	0	334	↑
7.	*Great Gaddesden Vicarage	Rev. W. T. T. Drake	8	1	0	427	↑
,,	*H. Hempstead—Apsley Mills	J. Dickinson & Co.	24	0	9	260	
8.	*Kensworth—The Grove	Miss S. Grace Jones	5	1	0	630	B
,,	Harpenden—Rothamsted	Lawes Agric. Trust	5	0	9	420	T
,,	*St. Albans—Gorhambury	W. Newberry	5	1	0	423	T
,,	* ,, Herts County Museum	John Hopkinson	5	1	0	386	T
,,	* ,, Bone Hill	H. J. T. Broadwood	5	1	0	336	↑
9.	* Elstree—Aldenham House	Edwin Beckett	10 sqr.	4	9	305	
10.	* Watford—Orphan Asylum	Dr. O. C. Cockrem	5	1	0	231	T
,,	* ,, Frogmore	Arthur P. Blathwayt	5	1	0	182	T
,,	,, Colne Val. W'r W'ks.	William Verini	5	1	6	220	
,,	*Rickmansworth—Moor Park	Lord Ebury	5	2	0	340	↑
12.	*Welwyn—Bridge House	B. Wilfred Thomas	5	0	6	228	?
,,	*Datchworth Rectory	Rev. Andrew Amos	5	1	0	386	T
,,	Hertford—Marden Hill	Richard Hoare	5	1	0	257	T
13.	*Stevenage—Weston Park	M. R. Pryor	5	0	8	470	T
,,	*Bennington—Desmond Cottage	Miss M. C. Nihill	5	1	0	408	
,,	* ,, Bennington House	Rev. Dr. Parker	5	1	0	408	↑
14.	*Therfield Rectory	Rev. John G. Hale	5	4	0	510	↑
,,	*Throcking Rectory	Rev. C. W. Harvey	5	1	0	484	T
15.	*Much Hadham	T. Woodham Mott	5	1	0	222	B
16.	Harlow—Gilston Park	William Cooper	8.	0	6	175	T
17.	*Hertford—Bayfordbury	W. Clinton Baker	8	1	2	250	
,,	*Ware—Fanhams Hall	Miss V. M. Croft	8	1	0	235	T
,,	* ,, Red House	Joseph Francis	5	4	0	115	T
18.	*Broxbourne—Stafford House	G. J. Newbery	5	1	0	118	T
,,	Northaw—Northacre	F. W. Poland	5	1	0		
,,	*New Barnet—Gas Works	T. H. Martin	8	0	9	212	

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TABLE II.—RAINFALL IN

River Districts.			Stations.	Jan.	Feb.	Mar.
				ins.	ins.	in.
Ouse	Cam	1. Rhee	Royston—Union Workhouse	2·65	3·91	·65
			,, Melbourne Street	2·64	4·38	·71
			Odsey	2·81	3·92	·67
	Ivel	2. Upper Ivel	Baldock—High Street	3·05	4·67	·75
		3. Hiz	Hitchin—Preston	3·16	5·03	·80
			,, The Firs	3·11	4·49	·86
			,, The Maples	2·88	4·25	·70
			,, High Down	2·98	3·29	·78
Thames	Thame	4. Up. Thame	Tring—Pendley Manor	4·14	5·98	·96
			,, Bulbourne	3·95	4·85	·78
	Colne	6. Bulbourne	Cowroast	3·74	4·91	·82
			,, Offside Cottage	3·81	5·12	·86
			Northchurch—The Limes	3·71	4·55	·79
			Berkhamsted—Fairhill	3·35	4·65	·73
			,, Rosebank	3·92	5·50	·80
			,, Rose Cottage	4·02	5·28	·83
		7. Gade	Great Gaddesden Vicarage	3·84	4·23	·64
			Hemel Hempstead—Apsley Mills	4·01	5·30	·88
		8. Ver	Kensworth—The Grove	3·44	4·51	·86
			Harpenden—Rothamsted	3·54	4·82	·95
			St. Albans—Gorhambury	3·51	4·40	·90
			,, Herts County Museum	3·59	4·87	·83
			,, Bone Hill	3·55	4·08	·81
		9. Up. Colne	Elstree—Aldenham House	3·28	3·42	1·00
		10. Lo. Colne	Watford—London Orphan Asylum	3·41	3·62	·81
			,, Frogmore	3·14	3·60	·87
			,, Colne Valley Water Works	3·40	4·48	·89
			Rickmansworth—Moor Park	4·02	3·28	·97
	Lea	12. Mimram	Welwyn—Bridge House	3·00	5·05	·72
			Datchworth Rectory	2·89	4·99	·71
			Tewin—Marden Hill	2·94	4·47	·58
		13. Beane	Stevenage—Weston Park	3·03	3·19	·82
			Bennington—Desmond Cottage	2·63	3·73	·85
			,, Bennington House	2·67	3·91	·66
		14. Rib	Therfield Rectory	2·74	4·28	·78
			Throcking Rectory	2·90	4·36	·83
		15. Ash	Much Hadham	3·11	3·56	·77
		16. Stort	Harlow—Gilston Park	3·09	3·81	·75
		17. Upper Lea	Hertford—Bayfordbury	3·00	4·19	·69
			Ware—Fanhams Hall	3·19	3·28	·77
			,, Red House	3·11	3·05	·62
		18. Lower Lea	Broxbourne—Stafford House	3·21	4·03	·64
			Northaw	3·33	3·21	·75
			New Barnet—Gas Works	3·09	4·27	·68
Mean for the County				3·28	4·29	·78

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Hertfordshire in 1900.

Apl.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Days.
in.	in.	ins.	ins.	ins.	in.	ins.	ins.	ins.	ins.	
·82	1·29	2·74	·95	3·09	·45	2·00	1·88	2·30	22·72	167
·83	1·20	2·44	·88	3·19	·45	1·86	1·89	2·28	22·75	166
1·18	1·24	2·67	1·85	2·63	·31	1·99	1·8[illegible]	2·04	23·19	185
1·32	1·15	2·88	1·75	2·94	·41	2·43	1·78	2·11	25·24	167
1·08	1·23	2·69	1·10	2·87	·48	2·30	2·15	2·84	25·73	171
1·43	·99	2·30	1·96	3·35	·36	2·15	1·93	2·54	25·47	177
1·38	·89	2·11	1·60	3·18	·32	2·09	1·76	2·31	23·47	177
1·14	1·02	2·58	2·07	2·94	·36	2·16	1·73	2·24	23·29	169
1·15	1·32	3·29	1·97	3·69	·62	2·85	3·39	3·55	32·91	207
1·07	1·17	3·32	2·07	3·24	·44	2·33	3·02	3·06	28·94	209
1·20	1·27	3·04	1·51	3·23	·64	2·51	3·17	3·68	29·72	165
1·15	1·27	2·99	1·50	3·17	·64	2·44	3·20	3·59	29·74	186
·95	1·14	2·27	2·01	3·04	·58	2·18	2·85	3·44	27·51	173
·92	1·09	2·16	1·87	3·13	·59	2·26	2·74	3·32	26·81	188
1·02	1·09	2·13	1·89	3·32	·69	2·32	2·80	3·43	28·91	186
1·06	1·07	2·17	1·76	3·37	·80	2·24	2·90	3·46	28·96	191
·91	1·55	2·18	1·55	3·32	·63	2·52	2·97	3·37	27·71	175
1·24	1·14	2·90	1·84	3·57	1·31	2·83	2·94	3·86	31·82	183
1·63	1·15	2·87	2·09	2·63	·72	1·97	2·91	3·48	28·26	161
1·33	1·06	2·56	1·07	3·70	·73	2·45	2·45	3·52	28·18	184
1·15	·99	2·14	·92	4·17	·76	2·50	2·49	3·44	27·37	193
1·29	1·10	2·95	·93	3·11	·73	2·19	2·29	3·62	27·50	194
1·28	·99	2·75	·72	3·29	·77	2·17	2·53	3·18	26·12	197
1·36	1·21	3·37	·85	2·85	·82	2·60	2·86	3·12	26·74	165
1·16	1·22	2·42	·90	3·85	·87	2·34	2·42	3·41	26·43	183
1·11	1·35	3·15	·93	3·99	·80	2·51	2·45	3·08	26·98	179
1·19	1·32	2·86	·72	3·46	·83	2·44	2·37	3·05	27·01	178
1·19	1·20	2·94	·75	3·45	1·12	2·22	2·88	3·55	27·57	191
1·20	1·15	2·45	1·03	2·67	·72	2·02	2·17	3·15	25·33	176
1·06	·99	2·38	·99	2·96	·70	2·30	2·19	2·97	25·13	148
·98	·94	2·25	·69	2·24	·88	1·94	2·27	2·35	22·53	143
1·25	1·19	2·81	·94	3·38	·62	2·11	2·42	2·65	24·41	180
1·20	·99	2·32	1·29	2·88	·73	2·13	2·23	2·91	23·89	190
1·21	1·08	2·40	1·03	2·89	·59	2·07	1·94	2·85	23·30	197
·91	1·37	3·08	1·15	3·39	·43	2·02	2·09	2·32	24·56	185
1·18	1·65	2·34	1·07	3·27	·57	1·93	1·97	2·42	24·49	178
1·45	1·06	2·55	·91	3·18	·75	2·00	2·09	2·63	24·06	157
1·32	1·13	3·15	1·01	3·99	·57	2·03	1·97	3·68	26·50	149
1·36	1·11	2·29	·95	2·96	·59	2·06	2·10	2·80	24·10	191
1·20	1·29	2·14	·88	2·87	·72	1·97	1·96	2·40	22·67	160
1·23	·94	2·43	1·02	2·49	·93	1·78	1·85	2·43	21·88	155
·94	1·06	2·16	1·13	2·30	·91	2·06	1·88	2·55	22·87	168
·97	1·03	2·34	1·11	2·87	·60	2·42	2·52	2·97	24·12	185
·94	1·18	2·79	·74	2·20	·97	2·27	2·54	3·15	24·82	162
1·16	1·16	2·61	1·27	3·14	·67	2·23	2·38	2·98	25·95	177

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July 16, Rosebank, Berkhamsted, 1·14 in.; August 3, Apsley Mills, 0·96 in.; Sept. 27, Moor Park, Rickmansworth, 0·55 in.; Oct. 4, Frogmore, Watford, 0·72 in.; Nov. 6, Pendley Manor and Cowroast, Tring, 0·52 in.; Dec. 30, Pendley Manor, 1·01 in.

The day in each month on which a heavy fall of rain was most general over the county was—Jan. 6, Feb. 15, March 18, April 3, May 22, June 1, July 27, August 3, Sept. 27, Oct. 29, Nov. 24, Dec. 30; and in the year, Dec. 30.

The average number of wet days in each month was as follows:—Jan., 21; Feb., 17; March, 11; April, 13; May, 11; June, 16; July, 8; August, 14; Sept., 7; Oct., 17; Nov., 21; Dec., 21.

The deviation from the mean for the 30 years 1870–99 was—Jan., + 6; Feb., + 4; March, — 2; April =; May, — 1; June, + 4; July, — 6; August, =; Sept., — 6; Oct., + 1; Nov., + 5; Dec., + 5.

TABLE III.—SUPPLEMENTARY TO TABLES I AND II.

District.	Station.	Observer.	Gauge. Diameter.	Gauge. Height above Sea.	Rainfall.	Days.
			ins.	feet.	ins.	
1.	Odsey (2nd gauge)	H. G. Fordham	5	256 ↑	22·67	184
4.	Tring—Elm House	E. J. Le Quesne	5	460	28·01	183
7.	Chipperfield	A. W. Rivington	5	407 T	23·57	117
8.	Harpenden—Rothamsted	Lawes Agricultural Trust	8	420 T	27·10	169
,,	,, ,,	,, ,,	72 × 87	420 T	29·34	186
10.	Watford—St. Albans Rd.	H. Ruddle	5	240	22·84	125
12.	Welwyn—Danesbury	A. M. Blake	5	400	26·70	172
14.	Hamels Park	E. Wallis	5	400 T	24·51	138
17.	Hertford	W. B. Bryan	8	119	21·93	165

Distribution of the Rainfall throughout the County.—The following table (Table IV, p. 39) gives the mean fall in each month and in the year in each of the five river-districts represented, and in the two main hydrographical divisions of the county, the catchment-basins of the Great Ouse and of the Thames, and also the difference in the year from the mean for the 20 years 1880–99.

The mean fall in each of the minor river-basins or sub-districts represented was as follows:—(*Cam*) Rhee, 22·89 ins.; (*Ivel*) Upper Ivel, 25·24 ins.; Hiz, 24·49 ins.; (*Thame*) Upper Thame, 30·92 ins.; (*Colne*) Bulbourne, 28·61 ins.; Gade, 29·76 ins.; Ver, 27·49 ins.; Upper Colne, 26·74 ins.; Lower Colne, 26·99 ins.; (*Lea*) Mimram, 24·33 ins.; Beane, 23·87 ins.; Rib, 24·53 ins.; Ash, 24·06 ins.; Stort, 26·50 ins.; Upper Lea, 22·88 ins.; Lower Lea, 23·94 ins.

A peculiar feature of the distribution of the rainfall is brought out by the above. In eight months of the year the heaviest falls were in a small area between Tring, Great Gaddesden, and Hemel Hempstead; for three of those months at Pendley Manor, and for three at Apsley Mills. The rainfall exceeded one inch on six

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occasions during the year, such falls occurring in the aggregate at 27 stations; 15 of the 27 records are from this area, 6 are from the neighbourhood of Hitchin and Baldock, 4 are from the valley of the Ver, and the other two are contributed by Moor Park and Therfield. The heaviest falls of rain seem to have been on the high ground between the sources of the Thame and the Bulbourne, and in the Bulbourne and Gade valleys.

TABLE IV.—RAINFALL IN THE RIVER-DISTRICTS.

MONTHS.	CAM.	IVEL.	THAME.	COLNE.	LEA.	OUSE.	THAMES.
	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Jan.	2·70	3·03	3·86	3·63	3·00	2·91	3·36
Feb.	4·07	4·35	5·42	4·48	3·96	4·24	4·30
March	·68	·78	·87	·85	·73	·74	·80
April	·94	1·27	1·11	1·17	1·15	1·15	1·16
May	1·24	1·06	1·24	1·18	1·13	1·13	1·16
June	2·62	2·51	3·31	2·72	2·49	2·55	2·65
July	1·23	1·70	2·02	1·27	1·00	1·52	1·19
August	2·97	3·05	3·46	3·37	2·91	3·02	3·17
Sept.	·40	·39	·53	·78	·71	·39	·73
October	1·95	2·22	2·59	2·37	2·07	2·12	2·25
Nov.	1·88	1·87	3·21	2·73	2·14	1·88	2·49
Dec.	2·21	2·41	3·30	3·42	2·76	2·33	3·12
Year	22·89	24·64	30·92	27·97	24·05	23·98	26·38
Diff. from 1880–99	+0·06	+0·20	+2·65	+0·44	−0·70	+0·13	+0·20

The total yearly fall ranged from 21·88 inches at the Red House, Ware, to 32·91 inches at Pendley Manor, Tring; and the total monthly fall from 0·31 inch at Odsey in September to 5·98 inches at Pendley Manor in February. The greatest fall in any one day was 1·80 inch at Pendley Manor on the 13th of February.

Distribution of the Rainfall in each Month.—The nomenclature used in the following account of the chief falls of rain is the same as in my previous reports, falls of at least ½ inch being styled *considerable*, ¾ inch *very considerable*, 1 inch *great*, 1¼ inch *very great*, 1½ inch *heavy*, and 1¾ inch *very heavy*. There was no *excessive* fall (2 inches). This analysis only applies to the thirty-two stations for which I have returns of the daily rainfall, except when the fall was the heaviest in the month and reached at least one inch. The wettest days which are given in each month are those at forty-four stations.

JANUARY.—A very wet month with many days of rain or snow. At most stations rain fell every day for the first nine days, and there were not two days together without rain or snow after the 13th. A little snow fell, with rain, on the 14th, and from the 27th to the 30th. The fall of rain was *considerable* at ten stations on the 1st; and on the 6th it was *considerable* at fourteen stations,

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very considerable at ten, *great* at Rothamsted (1·00 in.), Gorhambury, St. Albans (1·02 in.), Northchurch (1·04 in.), Rose Cottage, Berkhamsted (1·06 in.), and Rosebank, Berkhamsted (1·08 in.), and *very great* at Apsley Mills (1·27 in.). The 1st was the wettest day at one station, and the 6th at 43 stations.

FEBRUARY.—Excessively wet, in fact the wettest February on record for the County, but with not nearly so many wet days as January. Snow fell on the 1st to 4th, 10th, 13th to 16th, and 20th, on some of these days with rain. Much the heaviest fall of snow was on the 13th. At Datchworth, the Rev. Andrew Amos says, the falls of snow, equivalent to 1·98 in. of water, filled the roads hedge-top high and rendered them impassable. Being followed by 0·98 in. of warm rain, the lower roads were then two feet deep in water, and most of the higher ones were ankle-deep in running water. On the 2nd the fall, which occurred as snow, was *considerable* at 12 stations, *very considerable* at 5, and *great* at Therfield (1·09 in.) and Preston, Hitchin (1·15 in.). On the 13th it was *considerable* at 5 stations, *very considerable* at 3, *great* at Baldock (1·00 in.), and *very heavy* at Pendley Manor (1·80 in.), this day's fall also being in the form of snow. On the 15th it was *considerable* at 2 stations, *very considerable* at 11, *great* at Rosebank, Berkhamsted (1·04 in.), The Grange, St. Albans (1·05 in.), The Firs, Hitchin (1·07 in.), Northchurch (1·10 in.), The Maples, Hitchin (1·12 in.), and Rose Cottage, Berkhamsted (1·17 in.), *very great* at Apsley Mills (1·39 in.), and *heavy* at Offside Cottage, Cowroast (1·64 in.), both rain and snow falling on this day. The 2nd was the wettest day at 12 stations, the 13th at 6, the 15th at 24, the 24th at one station, and the 27th at one.

MARCH.—A very dry month, but with small falls of rain or snow (chiefly the latter) on a good many days for the quantity recorded. There was no *considerable* fall. The 18th was the wettest day at 36 stations, the 19th at 4, the 21st at one station, the 27th at 2 stations, and the 18th and 21st were the wettest at one station.

APRIL.—A rather dry month, with an average number of rainy days. There was a thunderstorm on the 5th with rain and hail. The fall of rain was *considerable* at 3 stations on the 3rd and at one station on the 5th. The 3rd was the wettest day at 33 stations, the 5th at 9, the 30th at one station, and the 31st at one.

MAY.—Rather dry, with about the average number of rainy days. The only *considerable* fall of rain was on the 24th, at one station (Great Gaddesden). The 6th was the wettest day at 8 stations, the 8th at 4, the 9th at 6, the 22nd at 15, the 23rd at 5, the 24th at 2, the 8th and 22nd were the wettest at 2 stations, and the 22nd and 23rd at one station.

JUNE.—Rather wet, with rain on a considerable number of days. There were thunderstorms on the 12th with heavy rain and hail. At Berkhamsted, Mr. Mawley says, during a thunderstorm in the morning, rain fell in one minute at the rate of over 2½ inches an hour, and during another in the afternoon rain and hail fell in four minutes at the rate of nearly 2 inches an hour. On the 1st the

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fall of rain was *considerable* at 11 stations, on the 12th at one station, on the 24th at one, and on the 25th at 4 stations. The 1st was the wettest day at 26 stations, the 7th at 2, the 12th at 8, the 22nd at 3, the 25th at 3, and the 29th at 2.

JULY.—Rather dry, with rain on a small number of days, but with frequent thunderstorms, those on the 16th and 27th accounting for the wettest days at 42 out of our 44 stations. On the 16th the fall of rain was *very considerable* at Baldock, High Down, Fairhill (Berkhamsted), and Great Gaddesden; and *great* at Northchurch (1·00 in.), Kensworth (1·00 in.), The Firs, Hitchin (1·03 in.), Rose Cottage, Berkhamsted (1·04 in.), Odsey (1·09 in.), Apsley Mills (1·13 in.), and Rosebank, Berkhamsted (1·14 in.). Mr. Mawley says that the rain began here shortly after 1.30 p.m. and ceased 16 minutes later, coming down for four minutes at the rate of 7 inches an hour, both this and the 1·14 in. in 16 minutes being records for Berkhamsted. Mr. Fordham says that the rain lasted half an hour (1.30 to 2 p.m.) at Odsey. The thunderstorm on this day was very local, being confined to the north-west of the county, rain falling at very few stations in the Lea river-basin, and only to a small amount at those. On the 27th the fall was *considerable* at 8 stations, and on the 31st at one station. The 16th was the wettest day at 15 stations, the 27th at 27, the 29th at one station, and the 31st at one.

AUGUST.—A very wet month, but with only the average number of wet days, and very few thunderstorms, slight except on the 27th, when there were three between 2 and 8 p.m. Mr. Mawley says: "At the latter hour there was [at Berkhamsted] an unusually brilliant flash of lightning, which was immediately followed by one of the loudest thunderclaps I ever remember to have heard." On the 1st the fall of rain was *considerable* at 6 stations and *very considerable* at one station; on the 3rd it was *considerable* at 9 stations and *very considerable* at 9; on the 5th it was *considerable* at one station; on the 9th it was *considerable* at 5 stations; and on the 21st it was *very considerable* at one station (Gorhambury). The 1st was the wettest day at 9 stations, the 3rd at 28, the 9th at 3, the 21st at 2, and the 31st at 2.

SEPTEMBER.—The driest month in the year, with much the smallest number of wet days. The only *considerable* fall of rain was on the 27th, at one station (Moor Park). The 1st was the wettest day at 3 stations, the 26th at 8, the 27th at 23, the 30th at 9, and the 27th and 30th were the wettest at one station.

OCTOBER.—Rather wet, but not so for such a wet month as October usually is, and with rain on about the average number of days. On the 4th the fall was *considerable* at 5 stations, on the 28th at one station, and on the 29th at 6 stations. The 4th was the wettest day at 15 stations, the 28th at 4, the 29th at 21, the 31st at one station, the 4th and 28th were the wettest at one, the 4th and 29th at one, and the 8th and 31st at one.

NOVEMBER.—Rather wet, but with a little less than the average rainfall for November, the number of wet days, however, being

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unusually large. The only *considerable* fall of rain was on the 1st at one station (Bone Hill, St. Albans). The 1st was the wettest day at 4 stations, the 6th at 8, the 15th at one station, the 16th at 4 stations, the 24th at 18, the 28th at 5, the 1st and 24th were the wettest at two, and the 24th and 28th at two.

DECEMBER.—Very wet, with rain on a large number of days. On the 5th the fall was *considerable* at 5 stations, on the 8th it was *very considerable* at one station (Apsley Mills), and on the 30th it was *considerable* at 2 stations, *very considerable* at 28, and *great* at Moor Park (1·00 in.) and Pendley Manor (1·01 in.). The 30th was the wettest day at all stations.

Comparison with the Rainfall of the Adjoining Counties.—If the rainfall of Hertfordshire in 1900 be compared with that of the adjoining counties the result for the year will be found to be very similar to that for the previous year, our county having an excess last year of 14·1 per cent. and in 1899 of 11·2 per cent. For the months the average at 20 stations in the adjoining counties shows a fall of rain about equal to that of Herts in March, May, July, and September (alternate months), but considerably less than that of Herts in all the other months of the year. The stations from which this result is deduced are—for Cambridgeshire, Wisbech, Thorney (Wryde), Ely, Cambridge (Trinity College), and Carlton Hall near Linton; for Bedfordshire, Aspley Guise; for Buckinghamshire, Buckingham (Adstock), Winslow, and Slough (Upton); for Middlesex, Harefield, and in London, Regent's Park, Camden Square, and Old Street; and for Essex, Newport, Halstead, Braintree, and Chelmsford (Spergula and High Street). The mean monthly rainfall at these stations was—Jan., 2·94 ins.; Feb., 3·69 ins.; March, 0·75 in.; April, 0·80 in.; May, 1·16 in.; June, 2·39 ins.; July, 1·29 in.; August, 2·80 ins.; Sept., 0·61 in.; Oct., 1·85 in.; Nov., 1·90 in.; Dec., 2·55 ins.; and for the year, 22·73 inches.

In order to check this result so far as concerns the rainfall in the year, the mean fall at a much larger number of stations (one to every 40 square miles in each county) has been computed, representative stations as widely distributed as possible being selected. The result is as follows:—Cambridgeshire (21 stations), 22·04 ins.; Bedfordshire (12 stations), 24·13 ins.; Buckinghamshire (18 stations), 25·02 ins.; Middlesex (7 stations), 22·87 ins.; and Essex (33 stations), 20·94 ins.; the mean for the whole of the 91 stations being 22·60 ins. This value is very near to that given for the 20 stations for which the mean monthly fall of rain has been computed, and gives an excess for Hertfordshire of about 3½ inches. This is chiefly owing to the small rainfall in the large area occupied by the counties of Cambridge and Essex.

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III.

NOTES ON LEPIDOPTERA OBSERVED IN HERTFORDSHIRE IN THE YEAR 1900.

By A. E. Gibbs, F.L.S., F.R.H.S.

Read at Watford, 26th March, 1901.

I have the honour, as one of your recorders, to submit to the Society some additional local observations concerning insects belonging to the Order Lepidoptera, and also notes with regard to the occurrence of some rare species in the county during the year 1900. In the first place I should like to draw attention to what we have already succeeded in doing in the direction of enumerating the butterflies and moths which have been found in Hertfordshire. Of the 2,061 species included in Mr. Meyrick's 'Handbook of British Lepidoptera,' which is, I suppose, the most recent list we possess, 1,139, or rather more than half, have been recorded as occurring in the county. Whatever may be the state of our general knowledge of the natural productions of Hertfordshire—and I fear that so far as most of the Orders of insects are concerned, it is lamentably deficient—we can, as a Society, take credit for having given considerable attention to the Lepidoptera, for the compilation of this very respectable list is due for the most part to the energies of members of the Hertfordshire Natural History Society and Field Club.

During the past twelve months I have been collecting information for the articles on the Insecta of the county which will appear in the forthcoming Victoria History of Hertfordshire, and I have been favoured with several additional lists of captures by local entomologists, the most lengthy being compiled by Mr. E. George Elliman, of Chesham, who has explored the Tring district; Mr. W. C. Boyd, F.S.A., of The Grange, Waltham Cross, whose list comprises 745 species, including 107 Tortrices and 255 Tineina; and Mr. H. Rowland-Brown, M.A., F.E.S., of Harrow Weald. I hope that later on the lists from these districts will be published in our 'Transactions.' The compilation of the list of Hertfordshire Lepidoptera for the Victoria History has been a rather laborious task, but it will be a fairly complete catalogue of species observed up to the present time, and will, so far as our present knowledge goes, show their distribution throughout the county.

In my report for 1892 I dwelt at some length upon the occurrence of *Colias edusa* and *C. hyale* in Hertfordshire, that year having been one of the occasionally-recurring seasons in which these insects were present in great abundance. The past year has also proved to be what is known in entomological circles as an "*Edusa* year," both that species and *C. hyale* having been recorded. Mr. Arthur Cottam reports that both insects were plentiful, and refers to them as

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occurring at Watford, near Boxmoor, and at Tring on the Aldbury side of the railway. The Hon. C. Walter Rothschild, M.P., informs me that *C. edusa* was taken near Tring Windmill, and he captured several specimens of *C. hyale* within the county limits, though the bulk of about fifty specimens of the latter insect taken by himself, his brother, and the Tring Museum staff were found nearer Halton, on the Bucks side of the border. Mr. A. R. Heath, of Willesden, contributes a note to the 'Entomologist' of the capture of *C. edusa* a mile or two east of Radlett Station. It is also reported from Haileybury by Mr. Stockley, and I saw a specimen flying in St. Peter's Street, St. Albans, in August. Mr. Arthur Lewis and Miss A. Dickinson took both species in some abundance in a clover-field on New Farm, a mile north of the town. The variety of *C. edusa* known as *helice* is reported by Mr. A. T. Goodson of Tring, and Mr. A. Cottam of Watford. Contrary to the usual state of things, *C. hyale* has been more abundant in 1900 than *C. edusa*.

I am able to add two butterflies to our list. *Thecla betulæ*, the brown hairstreak, has been taken, though I think not in 1900, by Mr. Matthews of Stevenage, in Norton Green Woods; and a notable capture during the past year is that of one of the most brilliant of our British butterflies, *Lycæna bellargus* (*adonis*). It was captured by Mr. Arthur Cottam, at Aldbury, in the first week in September, and the Hon. N. Charles Rothschild also took it at the same place, and at Dancer's End. Mr. A. H. Kingston informs me that it is to be taken at Royston. Other "blues" recorded during the year are *L. corydon*, the chalk-hill blue, taken both by Mr. Arthur Lewis and Miss A. Dickinson at New Farm, and *L. argiolus*, the holly blue, occurring in the same neighbourhood.

A melancholy interest attaches to one of the most important records of the year. The Camberwell beauty (*Vanessa antiopa*) has been unusually abundant in England in 1900, and a specimen was captured in a class-room at the Hatfield Road Board School, St. Albans, by Mr. H. E. Vincer, one of the masters. Unfortunately Mr. Vincer has since fallen a victim to his love of science, for by a fatal error he drank some silver cyanide which he had prepared for experimental purposes. There are two other records of the occurrence of *V. antiopa* in our county in 1900, one having been seen near Brown's Lane, Tring, by the Hon. C. Walter Rothschild, and the second having been taken near Hatfield by a gentleman signing himself "F. W. F.," a note of the capture appearing above those initials in the 'Entomologist.'

Turning from the butterflies to the moths, I am pleased to say that *Plusia moneta*, about which Mr. S. H. Spencer gave us some interesting information in his notes on the insects of 1896, is still with us, Mr. W. C. Boyd having taken two specimens at Waltham Cross. Mr. P. J. Barraud again took *Orthosia suspecta* at Bushey Heath, on July 28th. This is the third specimen taken there. He also reports that *Eupithecia pumilata* occurs at Bushey Heath every year; but until now it has not been recorded for the county.

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Another interesting addition to our list is *Sarothripus undulanus* (*revayana*). Mr. Arthur Cottam writes to me with regard to it:—"This little moth, which is now placed at the head of the Bombyces, is, I believe, often overlooked by collectors who do not take the micros, as it looks like a large tortrix. I am glad to be able to record it now for Hertfordshire. I took one in 1899 in Bricket Wood, I feel sure, though I overlooked it at the time, and only recognized what it was at the end of the season. Feeling doubtful, I did not record it then, but last year (1900) Mr. A. Piffard took one at Felden, near Boxmoor, which he kindly gave to me, and Mr. Philip J. Barraud took another at Bushey Heath, so there is now no doubt of its being a Hertfordshire insect." The lappet moth (*Lasiocampa quercifolia*) has been unusually plentiful. At St. Albans several specimens were taken on the street lamps by a London and North-Western Railway employé who has now left the neighbourhood.

I should like to urge upon our entomological members to devote more attention to the smaller moths. The neighbourhood of Watford is almost virgin ground so far as the micros are concerned, while large areas in various parts of the county remain entirely unexplored.

May I also ask that other Orders of insects be studied. With the exception of the Lepidoptera and Coleoptera, we have practically no lists of our Hertfordshire insects, so that there remains much work yet to be done.

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IV.

NOTE ON THE APPEARANCE OF A FOREIGN BEETLE (*DIAXENES DENDROBII*) AT WATFORD.

By Aubrey Stawell-Stoyel.

Communicated by W. R. Carter, B.A.

Read at Watford, 26th March, 1901.

Four of these beetles have been caught in the greenhouse of "The Briars," Watford. They are natives of Upper Burmah and some parts of India. Little is known about the habits of the species except that it is an injurious insect and feeds on orchids of the genus *Dendrobium*, hence the derivation of its specific name "*dendrobii*." When the grub has remained inside the stem of the plant for a long time, sometimes extending to a period of two or three years, it eventually emerges in the form of the perfect insect. It rarely occurs singly, being as a rule met with in batches varying in number from six to a dozen.

The dates of the appearance at Watford of the four specimens of this beetle are interesting: the first, second, and fourth, which were females, were caught respectively on the 7th and 31st of January and the 17th of February; the third, a male, was caught on the 2nd of February and was much smaller than any of the females.

Diaxenes dendrobii is one of the Longicornes, the antennæ being about 7–16th of an inch long. Of the four beetles caught the dimensions are 7–16th to 11–16th of an inch long and 3–16th to 4–16th of an inch broad, and the markings are light and dark brown.

This is one of the many instances of insects being found far from their native haunts. In this case the explanation is probably that the beetles were brought over in the larval state in the roots or stems of the orchids on which they were found, and being kept under artificial heat they ultimately made their appearance and were captured.

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V.

NOTES ON BIRDS OBSERVED IN HERTFORDSHIRE DURING THE YEAR 1900.

By Alan F. Crossman, F.L.S., F.Z.S., M.B.O.U.

Read at Watford, 26th March, 1901.

Each year it becomes more difficult to obtain materials for my annual report on the birds of Hertfordshire. Our county list is now so extensive that the chances of adding to it are very slight. The number of my correspondents also decreases year by year. This may partly be due to there being no new records to communicate, for I am afraid that I have yet to convince observers that I am only too glad to receive notes on any of our county birds, rare or common, great or small. Let my correspondents take it from me that whatever notes may be sent to me concerning the wild birds of this county are always acceptable. How can I obtain adequate information as to the feathered inhabitants of Hertfordshire and their distribution in the county if people who reside in the various districts do not send me notes? I cannot, merely by spending an afternoon or two in a locality, hope to obtain such a knowledge of the birds in that place as those who have lived there the best part of their life. It is they whom I want to send notes to me, and if only I could persuade farmers and keepers to take an interest in this work I should be able in a very short time to compile a fairly good account of the birds of our county. It would give them very little trouble just to jot down day by day such birds as they noticed in their district, and in time it would become quite a pleasure, and would also largely increase the powers of observation and sight in which the present war in South Africa has shown so many of us to be wanting. The roughest of notes are all I want: it is not quantity but accuracy that I require.

I now give the notes on the various species. The year 1900 was, in our county at least, extremely unproductive in rare birds.

Missel-Thrush (*Turdus viscivorus*).—This bird was extremely plentiful in the autumn of last year.

Pied Wagtail (*Motacilla lugubris*).—I found in the neighbourhood of Aldbury several nests of this species which contained eggs of the cuckoo.

Grey Wagtail (*Motacilla melanope*).—I identified this species at Berkhamsted on 14th August, 1900, a date nearly two months earlier than usual.

Meadow-Pipit (*Anthus pratensis*).—I saw a few pairs of these birds on Berkhamsted Common, which undoubtedly from their behaviour were nesting, but I was unable to discover a single nest.

Great Grey Shrike (*Lanius excubitor*).—I cannot do better with regard to this species than quote a letter which appeared in

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the 'Field' newspaper from a Mr. C. H. Emson, which ran as follows:—"For three-quarters of an hour on the afternoon of March 18th [1900] I had under observation a Grey Shrike. I am unable to particularize further, because I could not determine by close observation whether the bird was the Great Grey Shrike (*L. excubitor*) or Pallas' Grey Shrike (*L. major*), though I should judge it to have been the former; it was certainly not the Lesser Grey Shrike (*L. minor*), as I could plainly see there was no trace of black on the forehead. I was attracted to the bird by seeing it sit in a conspicuous position on the top of a large thorn bush. The locality was Berkhamsted Common, Herts. Whatever its exact species it was a male in beautiful plumage. It was not at all shy, and was evidently enjoying the warmth of the declining sun in a sheltered part of the common. Its movements were eminently shrike-like; its tail was held out almost horizontally, with just a slight up and down motion, and it now and then flew down to the ground and back again to its perch. What delighted and surprised me most was to hear it uttering melodious notes in a subdued tone which must fairly be dignified with the name of a song, mingled with harsher sounds. I stalked it several times to get a closer view, but could never get more than a side or front view, as in flight it was always against the sky, so that I could not distinguish details of plumage. It always alighted on the summit of a thorn bush. Once when it passed over my head, its long graduated tail was very conspicuous. I followed it until it became too dusk to distinguish details. I think it must have been *Lanius excubitor*; but, as I have said, I could not get a sufficiently clear view of its open wings to see whether they had a single or a double bar, nor to distinguish the pattern of the secondaries." When I read the above letter I very much envied Mr. Emson's good luck, little thinking that I should see the same or a similar bird on the same common. However, on April 7th I was crossing Northchurch Common on a bicycle on my way to Bedford, when I caught a glimpse of a very light-coloured bird sitting on the top of a thorn bush. I immediately thought of the shrike, and, leaving my machine and taking out my field-glasses, I proceeded to examine it. When I first caught sight of the bird, it was sitting on the top of a thorn bush with its white breast showing up in a very conspicuous manner. It had two wing-spots which enabled me to identify the bird as probably *L. excubitor*. The tail seemed very long, and the black and white on the wings and tail were very conspicuous when the bird was flying. It generally sat on a bough with its body much bent forward, and when seen on the top of a tree against the sky, which was very dark and stormy, the bird looked splendid. This shrike has occurred on many occasions in Hertfordshire, but unfortunately the actual species has rarely been ascertained.

Pied Flycatcher (*Muscicapa atricapilla*).—On April 8th the Hon. A. Holland-Hibbert saw a male pied flycatcher in his garden at Munden where the river Colne passes through it. This is a

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early date for this species, which has appeared on a very few occasions in this county, one of the last being that when seen on three consecutive days in 1898 at Munden.

Hawfinch (*Coccothraustes vulgaris*).—This species was again very plentiful in north-west Hertfordshire.

Goldfinch (*Carduelis elegans*).—The goldfinch was not uncommon around Berkhamsted during the year.

Brambling (*Fringilla montifringilla*).—I saw a good many birds of this species in the neighbourhood of Berkhamsted in the early part of the year.

Lesser Redpoll (*Linota rufescens*).—I was shown an egg undoubtedly belonging to this species which had during the year been taken on Berkhamsted Common.

Common Crossbill (*Loxia curvirostra*).—These birds remained in the neighbourhood of Berkhamsted during the early part of the year, but then disappeared. The Hon. Walter Rothschild also has informed me that there were none round Tring last year.

Cirl-Bunting (*Emberiza cirlus*).—On May 20th I had the pleasure of first hearing and then seeing a male cirl-bunting near Aldbury, and I again saw it on one or two occasions later. I made a diligent search in the immediate neighbourhood for the nest, but I was unable to find it, although the female bird was most probably sitting somewhere near. The records of this species so far as Hertfordshire is concerned are very meagre, and it was therefore a great pleasure to me to recognize it on this occasion.

Long-eared Owl (*Asio otus*).—Mr. M. R. Pryor informs me that this species is somewhat on the increase in the neighbourhood of Stevenage.

Short-eared Owl (*Asio accipitrinus*).—Mr. Pryor also states that he has seen so many as thirty of these birds in a plantation to the north of Stevenage, while occasionally he has known one or two to stay throughout the Summer.

Hen-Harrier (*Circus cyaneus*).—A bird which was either this species or Montagu's harrier was seen by Mr. Pryor on the 8th of September, at Weston Park. The hen-harrier has occurred on several occasions in Hertfordshire, but the other species has been obtained only once.

Buzzard (*Buteo vulgaris*).—A bird of this species was shot near St. Albans on January 27th, and was preserved by Mr. Spary of that place. It measured three feet across the wings, and weighed two ounces short of two pounds. This species is a fairly regular visitant to Hertfordshire, one at least being seen every year.

(?) Golden Eagle (*Aquila chrysaëtus*).—In the 'Essex County Chronicle' for 15th January, 1891, there appeared the following paragraph:—"A fine specimen of the golden eagle has been shot at Theobalds, Waltham Cross. The bird was seen hovering over one of the woods, and it was brought to the ground with difficulty, six shots being fired at it. The wings measured seven and a half feet from tip to tip. On being approached the bird fixed its talons in a gamekeeper's leg and also severely lacerated one of his hands."

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I give the above quotation, not because I think the bird was a golden eagle, but because publication may bring forth further particulars. It is much more probable that the bird in question was a young sea-eagle (*Haliaëtus albicilla*), which differs from the other species in not having the legs feathered down to the feet, and which has occurred in Hertfordshire at least once before.

Osprey (*Pandion haliaëtus*).—On May 9th Street saw a bird at the Tring Reservoirs which he identified as belonging to this species. The last specimen of this bird, which has been recorded in this county on about eight occasions, was obtained at Wheathampstead on 18th September, 1887.

Cormorant (*Phalacrocorax carbo*).—This species, which occurred in the county on two occasions in 1899, was recognized by Street at the Tring Reservoirs in 1900 on June 2nd, August 8th, and November 15th. On the last occasion there were two birds.

Water-Rail (*Rallus aquaticus*).—Mr. Harold Procter informs me that during the whole of last winter a water-rail frequented his garden at Hunton Bridge, where it made its home in a fringe of sedge about a yard wide and five or six yards long.

Ringed Plover (*Ægialitis hiaticula*).—Ringed plovers were seen at Tring during the year.

Golden Plover (*Charadrius pluvialis*). — Street saw two large parties of these birds at the Tring Reservoirs in November.

Common Snipe (*Gallinago cœlestis*).—Mr. S. H. Spencer, jun., informed me that on May 5th he heard a snipe drumming over the scrub in Bricket Wood. This rather points to the probability that the bird was nesting in the locality, a fact which has not, I believe, been recorded in Hertfordshire before.

Dunlin (*Tringa alpina*).—Tring was visited by this species in 1900, thus making the year no exception to other years in the fact that these birds annually occur there on migration.

Common Sandpiper (*Totanus hypoleucus*). — Street identified common sandpipers at Tring on several occasions during the year.

Green Sandpiper (*Totanus ochropus*).—This bird also appeared at Tring on migration.

Redshank (*Totanus calidris*).—The redshank seems to occur in Hertfordshire more frequently than formerly; some were recognized at Tring on October 8th.

Greenshank (*Totanus canescens*).—This species occurs at the Reservoirs every year, and 1900 was no exception in this way.

Black Tern, Common Tern, and Little Tern (*Hydrochelidon nigra*, *Sterna fluviatilis*, and *S. minuta*).—These three species, which are regular visitors to Tring, occurred there in some numbers in 1900.

Common Gull (*Larus canus*).—Common gulls appeared at the Reservoirs in considerable numbers in the year.

Herring-Gull (*Larus argentatus*).—In addition to being seen at Tring this species was recognized at Weston Manor by Mr. Pryor.

Lesser Black-backed Gull (*Larus fuscus*).—This species was apparently seen at Tring by Street, who mentions having seen

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black-backed gulls. Mr. A. Sainsbury Verey also saw a bird of this species at Heronsgate.

GREAT BLACK-BACKED GULL (*Larus marinus*).—Street states that he saw great black-backed gulls at Tring, and Mr. Pryor saw a party of gulls. numbering from 60 to 80, which he put down as belonging to this species.

KITTIWAKE (*Rissa tridactyla*).—Kittiwakes were observed at Tring in May.

LITTLE AUK (*Mergulus alle*).—A bird of this species was picked up between Baldock and Stevenage by a woman who brought it to Mr. M. R. Pryor.

I now give the usual list of the arrival and departure of summer and winter migrants.

SUMMER MIGRANTS.

SPECIES.	LOCALITY.	DATE.	OBSERVER.
WHINCHAT (*Pratincola rubetra*)	Berkhamsted	April 24	A. F. C.
REDSTART (*Ruticilla phœnicurus*)	Berkhamsted	,, 21	A. F. C.
NIGHTINGALE (*Daulias luscinia*)	Hitchin	,, 18	A. W. Dawson.
	Hatfield	,, 19	T. Brown.
	St. Albans	,, 19	H. Lewis.
	Berkhamsted	,, 20	Miss Thursfield.
	Harpenden	,, 21	J. J. Willis.
	Watford	,, 22	Mrs. Hopkinson.
	Sawbridgeworth	,, 22	H. S. Rivers.
	Sandridgebury	,, 23	Mrs. Verity.
	Broxbourne	,, 23	Rev. H. P. Waller.
	Odsey	,, 26	H. G. Fordham.
WHITETHROAT (*Silvia cinerea*)	St. Albans	,, 23	H. Lewis.
	Berkhamsted	,, 24	A. F. C.
LESSER WHITETHROAT (*Silvia curruca*)	Berkhamsted	,, 24	A. F. C.
BLACKCAP (*Silvia atricapilla*)	St. Albans	,, 22	H. Lewis.
CHIFFCHAFF (*Phylloscopus rufus*)	St. Albans	,, 1	A. Spary.
	Berkhamsted	,, 6	A. F. C.
	Sandridgebury	,, 21	Mrs. Verity.
WILLOW-WARBLER (*Phylloscopus trochilus*)	Berkhamsted	,, 19	Miss Thursfield.
	St. Albans	,, 19	H. Lewis.
	Sandridgebury	,, 21	Mrs. Verity.
WOOD-WARBLER (*Phylloscopus sibilatrix*)	Berkhamsted	May 2	A. F. C.
SEDGE-WARBLER (*Acrocephalus phragmitis*)	St. Albans	,, 10	H. Lewis.
GRASSHOPPER-WARBLER (*Locustella nævia*)	Berkhamsted	April 20	A. F. C.
TREE-PIPIT (*Anthus trivialis*)	Berkhamsted	,, 18	A. F. C.
	St. Albans	,, 18	H. Lewis.
RED-BACKED SHRIKE (*Lanius collurio*)	Berkhamsted	May 20	A. F. C.
PIED FLYCATCHER (*Muscicapa atricapilla*)	Munden, Watford	April 8	Hon. A. Holland-Hibbert.
SPOTTED FLYCATCHER (*Muscicapa grisola*)	Odsey	May 6	H. G. Fordham.
	Broxbourne	,, 6	Rev. H. P. Waller.

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Species.	Locality.	Date.	Observer.
Spotted Flycatcher	Berkhamsted	May 7	Mrs. Mawley.
(*Muscicapa grisola*)	Hatfield	,, 8	T. Brown.
	Sawbridgeworth	,, 14	H. S. Rivers.
(Last seen)	Odsey	Sept. 10	H. G. Fordham.
Swallow	Hitchin	April 8	A. W. Dawson.
(*Hirundo rustica*)	Berkhamsted	,, 12	Mrs. Mawley.
	St. Albans	,, 16	H. Lewis.
	Sandridgebury	,, 17	Mrs. Verity.
	Odsey	,, 17	H. G. Fordham.
	Sawbridgeworth	,, 19	H. S. Rivers.
	Harpenden	,, 20	J. J. Willis.
	Watford	,, 21	Mrs. Hopkinson.
	Hatfield	,, 28	T. Brown.
(Last seen)	Odsey	Oct. 9	H. G. Fordham.
	Berkhamsted	,, 9	Mrs. Mawley.
	Hitchin	,, 10	A. W. Dawson.
	Sawbridgeworth	,, 24	H. S. Rivers.
	Broxbourne	,, 29	Rev. H. P. Waller.
	Royston	Nov. 3	D. Hill.
	Watford	,, 5	D. Hill.
House-Martin	Sandridgebury	April 19	Mrs. Verity.
(*Chelidon urbica*)	St. Albans	May 9	H. Lewis.
(Last seen)	Hunton Bridge	Oct. 8	H. Procter.
Swift	St. Albans	May 6	H. Lewis.
(*Cypselus apus*)			
(Last seen)	Hunton Bridge	Oct. 8	H. Procter.
Nightjar	Berkhamsted	May 20	A. F. C.
(*Caprimulgus europæus*)			
Wryneck	Berkhamsted	April 19	A. F. C.
(*Iynx torquilla*)	St. Albans	,, 20	H. Lewis.
Cuckoo	St. Albans	,, 18	H. Lewis.
(*Cuculus canorus*)	Berkhamsted	,, 19	Miss Thursfield.
	Sawbridgeworth	,, 19	H. S. Rivers.
	Broxbourne	,, 20	Rev. H. P. Waller.
	Sandridgebury	,, 21	Mrs. Verity.
	Watford	,, 21	Mrs. Hopkinson.
	Harpenden	,, 21	J. J. Willis.
	Hitchin	,, 22	A. W. Dawson.
	Hatfield	,, 23	T. Brown.
Turtle-Dove	Berkhamsted	May 2	A. F. C.
(*Turtur communis*)	St. Albans	,, 31	H. Lewis.
Common Sandpiper	Berkhamsted	,, 2	A. F. C.
(*Totanus hypoleucus*)			

Winter Migrants.

Redwing (*Turdus iliacus*)	(Last seen)	Berkhamsted	April 6	A. F. C.
Fieldfare (*Turdus pilaris*)	(Last seen)	Berkhamsted	,, 24	A. F. C.
Grey Wagtail (*Motacilla melanope*)	(First seen)	Berkhamsted	Aug 14	A. F. C.
		Hunton Bridge	Oct. 8	H. Procter.

In conclusion, I have to accord my best thanks to my correspondents, and I hope that they will continue to supply me with notes and will use their best endeavours to get others to do the same.

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VI.

REPORT ON PHENOLOGICAL PHENOMENA OBSERVED IN HERTFORDSHIRE DURING THE YEAR 1900.

By Edward Mawley, Sec. R. Met. Soc., F.R.H.S.

Read at Watford, 23rd April, 1901.

With the exception of a new station at Watford there has been no change in the list of observing stations since the last report was issued. The distribution of the stations continues satisfactory, the only part of the county altogether unrepresented being the neighbourhood of Buntingford in the north-east.

The following table gives the list of observers, the districts they represent, and the approximate height of the stations above sea-level. The sequence is from south to north.

Station.	Height above Sea-level.	Observer.
Wealdstone	180 feet.	G. E. Eland.
Watford (The Platts)	240 ,,	Mrs. G. E. Bishop.
Watford (Weetwood)	270 ,,	Mrs. J. Hopkinson.
Chesham (Cannon Mill Cottage)	300 ,,	Miss G. Keating.
Broxbourne	120 ,,	Rev. H. P. Waller.
St. Albans (Worley Road)	300 ,,	H. Lewis.
Berkhamsted (Rosebank)	400 ,,	Mrs. E. Mawley.
Hatfield (Symonds Hyde)	300 ,,	T. Brown.
Hertford	140 ,,	W. Graveson.
Sawbridgeworth	240 ,,	H. S. Rivers.
Harpenden (Hecla Villa)	370 ,,	J. J. Willis.
Hitchin	230 ,,	A. W. Dawson, M.A.
Ashwell (Odsey)	260 ,,	H. G. Fordham.

The Winter of 1899–1900.

There occurred two very cold periods during this winter, one in December and the other in February, each lasting about a fortnight; but throughout the rest of the season the weather remained as a rule unusually mild. On the coldest night in December a thermometer exposed on the surface of the snow at Berkhamsted registered 27 degrees of frost, and on the coldest night in February 28 degrees of frost. There were comparatively few days when no rain or snow fell, and the total rainfall was much in excess of the average. The sun shone at Berkhamsted for altogether 132 hours, which is a small record for the quarter.

The dry weather in December enabled the farmer to proceed with the cultivation of the land without any serious interruption, but the frequent and heavy falls of rain and snow in January and February so saturated the ground as to render the sowing of spring corn during those two months impracticable. The frosts in December and February served to give a timely check to the growth of the

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TABLE I.—DATES OF FLOWERING OF PLANTS OBSERVED IN 1900, WITH THE MEAN DATE FOR 1876–1899.

SPECIES.	WEALD-STONE.	WATFORD.		CHES-HAM.	ST. ALBANS.	BERK-HAMSTED	HAT-FIELD.	HERT-FORD.	SAW-BRIDGE-WORTH.	HAR-PENDEN.	HITCHIN.	ODSEY (Ashwell)	MEAN, 1876-99.
		THE PLATTS.	WEET-WOOD.										
Hazel (*Corylus avellana*)	.....	Jan. 24	Feb. 1	Jan. 28	.....	Feb. 22	.....	Feb. 22	Feb. 22	Feb. 23	.....	Jan. 26	Jan. 29
Coltsfoot (*Tussilago farfara*)	Mar. 25	.....	.....	Mar. 9	.....	Mar. 9	.....	Mar. 17	Mar. 12	Mar. 9	.....	.....	Feb. 26
Wood-Anemone (*Anemone nemorosa*)	Apl. 14	Apl. 14	.....	Apl. 15	Apl. 18	Apl. 13	Apl. 15	Mar. 28	.....	Apl. 15	Apl. 4	.....	Mar. 21
Blackthorn (*Prunus spinosa*)	Apl. 21	Apl. 19	Apl. 9	.....	.....	Apl. 21	Apl. 21	Apl. 13	Apl. 19	Apl. 14	Apl. 21	Apl. 16	Apl. 2
Garlic Hedge-Mustard (*Alliaria officinalis*)	.....	Apl. 25	Apl. 16	Apl. 19	.....	May 2	.....	Apl. 21	Apl. 23	Apl. 22	Apl. 20	.....	Apl. 20
Horse-Chestnut (*Æsculus hippocastanum*)	May 8	May 7	May 10	May 19	.....	May 23	May 8	May 13	May 14	May 15	May 12	.....	May 9
Hawthorn (*Cratægus oxyacantha*)	May 12	May 21	May 15	May 25	May 24	May 30	May 11	May 10	May 26	May 16	May 9	May 8	May 12
White Ox-Eye (*Leucanthemum vulgare*)	June 4	June 7	June 2	May 20	.....	May 28	.....	May 26	June 6	May 30	.....	.....	May 20
Dog-Rose (*Rosa canina*)	June 10	June 9	June 11	.....	.....	June 8	June 10	June 10	June 11	June 10	June 10	June 5	June 5
Black Knapweed (*Centaurea nigra*)	.....	.....	June 28	July 16	.....	June 25	July 18	July 3	.....	.....	.....	.....	June 23
Harebell (*Campanula rotundifolia*)	Aug. 18	.....	June 27	.....	.....	July 16	July 9	July 8	.....	.....	June 30	.....	July 5
Greater Bindweed (*Convolvulus sepium*)	.....	.....	July 25	July 16	.....	July 4	July 24	July 20	June 28	.....	.....	.....	July 9
Ivy (*Hedera helix*)	.....	.....	Sept. 21	Oct. 28	.....	Oct. 7	.....	Sept. 30	Oct. 7	.....	.....	Sept. 24	Sept. 27

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TABLE II.—EARLIEST DATES OF OBSERVATION OF BIRDS AND INSECTS IN 1900, WITH THE MEAN DATE FOR 1876–1899.

SPECIES.	WEALD-STONE.	WATFORD.		CHES-HAM.	BROX-BOURNE.	ST. ALBANS.	BERK-HAMSTED.	HAT-FIELD.	SAW-BRIDGE-WORTH.	HAR-PENDEN.	HITCHIN.	ODSEY (Ashwell)	MEAN, 1876–99.
		THE PLATTS.	WEET-WOOD.										
BIRDS.													
Song-Thrush (*Turdus musicus*)	.....	.....	.....	.....	Jan. 8	Jan. 5	Jan. 20	Jan. 23	Jan. 23	Feb. 23	Jan. 20	.....	Jan. 17
Swallow (*Hirundo rustica*)	Apl. 24	.....	Apl. 21	Apl. 19	.....	Apl. 16	Apl. 12	Apl. 28	Apl. 19	Apl. 20	Apl. 8	Apl. 17	Apl. 12
Cuckoo (*Cuculus canorus*)	.....	Apl. 22	Apl. 21	Apl. 21	Apl. 20	Apl. 18	Apl. 19	Apl. 23	Apl. 19	Apl. 21	Apl. 22	.....	Apl. 13
Nightingale (*Daulias luscinia*)	Apl. 28	Apl. 25	Apl. 22	Apl. 20	Apl. 23	Apl. 19	Apl. 20	Apl. 19	Apl. 22	Apl. 21	Apl. 18	Apl. 26	Apl. 15
Spotted Flycatcher (*Muscicapa grisola*)	.....	.....	.....	.....	May 6	.....	May 7	May 8	May 14	.....	.....	May 6	.....
Swallow (last seen) (*Hirundo rustica*)	Oct. 3	.....	.....	Oct. 9	Oct. 29	.....	Oct. 9	.....	Oct. 24	.....	Oct. 10	Oct. 9	.....
INSECTS.													
Honey-Bee (*Apis mellifica*)	.....	.....	Mar. 5	.....	Feb. 13	.....	Feb. 23	.....	Feb. 24	.....	.....	.....	Jan. 30
Wasp (*Vespa vulgaris*)	.....	Apl. 29	Apl. 26	Apl. 20	Apl. 21	.....	Apl. 22	.....	Apl. 11	.....	Apl. 18	.....	Apl. 5
Small White Butterfly (*Pieris rapæ*)	.....	Apl. 26	Apl. 18	Apl. 6	Apl. 21	.....	Apl. 13	.....	Apl. 22	Apl. 17	.....	.....	Apl. 4
Orange-Tip Butterfly (*Anthocaris cardamines*)	.....	.....	.....	May 5	.....	.....	May 26	.....	May 7	.....	May 5	.....	May 7
Meadow-Brown Butterfly (*Epinephile janira*)	.....	.....	.....	.....	.....	.....	Apl. 14	.....	June 28	.....	.....	.....	May 19

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autumn-sown wheat, which otherwise might have become what is termed "winter proud." Favoured by the generally mild weather, and the covering of snow when the frosts were keenest, the grass remained green throughout the season. The fall of snow in February, which for a fortnight lay to the depth of from three inches to a foot, must have afforded all the winter farm-crops very efficient protection during that time; for at Berkhamsted I find that on the three coldest nights the temperature beneath the snow was from 19 to 21 degrees higher than on its upper surface, while at no time did the buried thermometer show more than 8 degrees of frost.

The early part of the season was so mild that some garden flowers remained in bloom rather later in the year than usual. At Berkhamsted the last rose-bloom of the year in my garden was destroyed by frost on December 14th, which is five days later than the average date for the last rose in the previous fourteen years. The winter aconite was in flower at Berkhamsted on January 23rd, and at Watford (The Platts) on the following day—the former date being one day later than the average for the same spot in the previous eleven years. At Hitchin the heavy snowstorm which occurred on the night of February 1st did considerable damage to shrubs in that neighbourhood. On the 24th of February rooks began building at Harpenden.

The first fertile flowers appeared on the hazel eleven days later than their average date for the previous twenty-four years, and later than in any year since 1895.

The song-thrush was first heard after the beginning of the year five days later than its mean date. The honey-bee was first seen to visit flowers twenty-five days behind its usual time.

The Spring.

This was the coldest spring since 1891, and only once before (1893) in the previous forty-four years have the same three months proved as dry. Although taken as a whole a cold spring, at no time did the thermometer exposed on the lawn show more than 15 degrees of frost, which is a high extreme minimum temperature for the season. The average daily duration of bright sunshine at Berkhamsted amounted to 4¾ hours a day, or rather less than is seasonable.

The land had become so saturated through the winter rains, that, although the early part of March proved dry, it was not until after the middle of that month that the sowing of spring corn could be proceeded with, and even then there were frequent interruptions owing to repeated light falls of rain, snow, and sleet. At the end of the season the autumn-sown corn presented a very promising appearance. The grass, on the contrary, made but slow progress, as there was comparatively little sunshine to warm the ground, and but a scanty supply of rain to moisten it. In order to give some idea of the unusual dryness of this spring I may state that during the whole of May no rain-water whatever came through

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my percolation-gauge on which short grass is growing, and less than a quarter of a gallon through the uncropped gauge. Both gauges are a yard square and have a depth of 2¼ feet of soil.

The redeeming feature of this otherwise unfavourable season, so far as garden crops were concerned, was the absence of any killing frost. For, although there occurred, even in May, several frosty nights, yet at no time did the temperature fall sufficiently low to inflict any serious injuries on the young growths. At Wealdstone the almond flowered on April 4th, and a swift was seen on May 8th. Two days earlier the first swift was observed at St. Albans.

All the spring flowers were behind their mean dates in coming into blossom, and especially was this the case before the short spell of hot weather set in in April. For instance, the coltsfoot was sixteen days late, the wood-anemone twenty-two days late, and the blackthorn fifteen days late, whereas the garlic hedge-mustard, the horse-chestnut, and the hawthorn were respectively only two, four, and five days late. On the other hand, the white ox-eye, no doubt owing to the cold period in the middle of May, was as much as eleven days late.

As was the case in the previous year, all the spring migrants arrived behind their usual time, the swallow being six days late, the cuckoo eight days late, and the nightingale seven days late.

The wasp made its appearance sixteen days late, the small white butterfly fourteen days late, the orange-tip butterfly four days late, and the meadow-brown butterfly (if we may judge from the two very different dates given by the only observers mentioning it) three days late.

The Summer.

There have been few summers in recent years so warm as that of 1900, and yet but for the great heat which prevailed during the last three weeks in July the mean temperature would have come out in no way exceptional, for June was only moderately warm, and August of about a seasonable temperature. Taking the three months together, this was if anything rather a wet season. The sun shone on an average at Berkhamsted for 1¾ hours a day longer than usual.

After the cold weather in May, the change to more genial conditions in June was welcomed by the grass, but unfortunately it came too late to save the hay-crop, which proved almost everywhere an unusually light one. The fact is that the ground had previously become so dry that the roots of the grass were unable to take anything like full advantage of this welcome change. The dry state of the soil also affected the corn-crops, but not nearly to the same extent. The three weeks of hot weather in July caused the corn to ripen so rapidly that the harvest, which at one time promised to be a very late one, proved after all rather early than otherwise. The first ten days in August were very stormy, but after this the ingathering of the corn was carried on with but few

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hindrances from rain. For the turnips and swedes the season was by no means a favourable one, owing at first to the dryness of the ground and afterwards to the great heat and dry atmosphere. The same adverse conditions caused the keep in the pastures to become bare and parched.

In the gardens the dry and almost tropical weather in July was keenly felt, and very little growth was made. Even the one or two heavy thunderstorms of that month afforded but little relief, for the lawns soon became as brown as before. But in August, notwithstanding the low temperature, vegetation made rapid growth, owing to the great warmth of the soil and subsoil. Indeed, for the first time since the winter the soil had become completely saturated.

Mrs. G. E. Bishop writes as follows from The Platts, Watford, on July 20th: "No rain, garden burnt up, and vegetables parched," and again on August 13th: "Wild flowers very scarce." At Wealdstone the first wheat was cut on July 30th, and the first ripe blackberry gathered on August 18th. At Berkhamsted the westerly gales in the first week in August did considerable damage in the garden among the dahlias and other plants insufficiently staked. At Harpenden Mr. Willis states that the first wheat-ear was observed out of its sheath on June 13th, or five days later than its average date in the previous eight years.

The summer plants, notwithstanding the great heat in July, were all late in flowering. The dog-rose was four days late, the black knapweed thirteen days late, the harebell eight days late, and the greater bindweed six days late.

The Autumn.

This was a remarkably warm autumn, and on no night did the exposed thermometer show more than 12 degrees of frost. The rainfall was very light, and especially was this the case in the first two months of the quarter. The record of clear sunshine at Berkhamsted exceeded the autumn average by about half an hour a day.

Scarcely a drop of rain fell during the first three weeks in September, so that the harvest operations were completed under the most favourable circumstances. The turnips, which had greatly benefited by the August rains, again passed through a trying ordeal during the dry weather in September. October and November, however, proved so propitious, both as regards temperature and rainfall, that, considering the time of year, the roots materially improved. The mangolds once more showed their power of resisting dry seasons and yielded an excellent crop. The pastures, however, suffered in the same way as the turnips and swedes through the autumn drought, but by the end of October the grass had greatly recovered, and it remained green throughout the rest of the season—in fact, made better growth than at any time since the hay harvest. In the early part of this autumn the ground was exceptionally dry for the time of year.

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For instance, until October 4th not a drop of rain had come through the soil in my uncropped percolation-gauge for more than a month. Good progress was made during the season with the preparation of the land for the reception of winter corn, for even in November the wet weather caused but brief interruptions owing to the dry subsoil rapidly absorbing all superfluous moisture. The yield of the principal farm-crops, taking the county as a whole, was, according to the returns sent in to the 'Agricultural Gazette,' as follows:—Wheat was about average, barley and oats were both more or less under average. The yield of mangolds was good, but turnips, hay, and potatoes were all much under average.

Seldom has there been an autumn more favourable for all garden crops. In the kitchen garden the vegetables made surprising growth considering the check they had received during the summer, while dahlias and other autumn-flowering plants remained in full flower until an unusually late period in the year. My dahlias at Berkhamsted were still flowering freely when cut down by frost on November 11th, which is a week later than the average date of their destruction in the previous fifteen years. Only once before during that period, viz. in 1898, have they remained altogether uninjured so late in the autumn. On the same night the dahlias were killed at Watford. At Hatfield wasps are reported to have been very numerous in the early part of the season.

According to the returns sent in to the 'Gardeners' Chronicle,' the yield of fruit in Hertfordshire comes out as follows:—Apples proved an abundant crop, but the fruit was mostly small, while the yield of pears and plums was about average. Raspberries, currants, and gooseberries were above average, but the crop of strawberries was only an average one.

The ivy was eight days behind its average date in coming into flower.

The swallow took its departure seventeen days later than its average date for the previous nine years.

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VII.

OSTRACODA FROM THE *CHARA*-MARL OF HITCHIN.

By Frederick Chapman, A.L.S., F.R.M.S.

Communicated by John Hopkinson, F.L.S.

Read at Watford, 23rd April, 1901.*

The *Chara*-marl or "fresh-water bed" of Hitchin is so remarkably rich in Ostracoda that it appears desirable to put upon record more detailed information regarding them than has been attempted up to the present time. They have already been referred to in a note by Messrs Jones and Sherborn on a collection made by Mr. William Hill, F.G.S.† The four species there recorded are *Cypris incongruens*, *Scottia Browniana*, *Erpetocypris reptans*, and *Candona candida*. The same authors subsequently‡ noted an additional species, *Cypridopsis vidua* [=*Pionocypris vidua*]; while for the previously recorded *Cypris incongruens* they substituted *Candona pubescens*.

For the material from which the species here enumerated have been extracted I am indebted to Professor T. Rupert Jones, F.R.S., who had received it from Mr. W. Hill a long time ago. The present list contains only one species which I have not myself found, and eight species with two varieties are now added to the earlier records.

The bed containing the Ostracoda here under notice lies upon a bed of gravel, and is itself overlain by a bed of brickearth 20 feet thick. It is a "soft calcareous loam, of a light colour, from brown to almost white, which has been found, in other parts of the brickfield, to pass down into a dark grey or almost black deposit, fairly evenly stratified."‖

Besides the Ostracoda this deposit contains numerous stems and fruits (oogonia) of *Chara*, eleven species of Mollusca, and the remains of bear, deer, and rhinoceros.

The sample of marl examined was exceedingly rich in Ostracod valves, but they are very fragile and require care in the extraction. The process of washing the marl and separating the organisms is best carried out by submerging a sieve, containing some of the marl, under water, the sieve having meshes fine enough to retain the minute fossils; and from time to time agitating the sieve vertically as well as in a horizontal and circular direction.

The following is a list of the Ostracoda from the deposit at Hitchin so far as at present known.

* Abridged by permission from the 'Annals and Magazine of Natural History,' ser. vi, vol. xix, pp. 591–597 (June, 1897), which should be referred to for the synonymy of the various species and their illustration (on plate xv).—Ed.

† 'Geol. Mag.,' dec. iii, vol. iv, p. 459 (1887).

‡ 'Suppl. Monogr. Tert. Entom.,' p. 12 (Pal. Soc., 1889).

‖ 'Proc. Geol. Assoc.,' vol. xiv, p. 416 (1896).

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Family Cyprididæ.

Cyclocypris lævis (O. F. Müller).—This species is fairly common in the fresh-water bed of Hitchin. It is a common form in this country in fresh and brackish water.

Cyclocypris globosa (G. O. Sars).—The discovery of this species in the Hitchin deposits is of much interest, for it is quite a northern species, having been recorded from fossil deposits in Scotland; and as a recent form it is still found living in the locks and pools of the border counties of England, in Scotland, and in Norway. It is by no means uncommon at Hitchin.

Scottia Browniana (Jones).—This is also a northern species. Mr. T. Scott found it living in pools in the island of Bute. It was found fossil at Clacton, Essex, by Professor Rupert Jones, and has since been recorded by him from Hitchin and from Sidestrand, Suffolk, and Chesilton, Dorset.

Cypris virens (Jurine).—A common and widely-distributed form, and as a recent species inhabiting "grassy pools and ditches which dry up in summer" (Brady and Norman). Only one valve was found in the marl from Hitchin.

Erpetocypris reptans (Baird).—This is a common British species, and its European distribution is wide. As a fossil it has been found in strata as old as the Weybourn Crag. At Hitchin it is common and often of large size, some of the valves measuring as much as 3·3 millimetres in length.

Pionocypris vidua (O. F. Müller).—This species has been found as a post-Tertiary fossil in the Fen district, and it is common as a fresh-water form in England and Europe generally. At Hitchin it is not uncommon.

Ilyocypris gibba (Ramdohr). — This species, well known as a recent form, is also known from the Hamstead beds (Oligocene) of the Isle of Wight, and it is common as a post-Tertiary fossil in England and Scotland. At Hitchin only one well-differentiated specimen was found, and in this the principal tubercle is prominent and recurved.

Ilyocypris Bradii, G. O. Sars. — The commoner form of this genus in the Hitchin deposit appears to be the non-tuberculate type defined by Sars under the above name, of which three valves were found.

Candona pubescens (Koch).—This is a common species in the living condition. As a post-Tertiary fossil it has been recorded from Whittlesea, the valley-drift near Salisbury, the old land-drift at Chesilton, Portland, the gravels at Barnwell near Cambridge, and from Hitchin, where well-formed valves are found, but they are not very common. There are also present several valves of the form usually described under the name of *C. albicans*, but now thought to be only the young of *C. pubescens*.

Candona lactea, Baird.—This common fresh-water species, which is well known from numerous post-Tertiary deposits, is very common at Hitchin.

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Candona candida (O. F. Müller).—This species is very common in ponds and ditches. As a fossil it is known from the Weybourn Crag and from most deposits of post-Pliocene age. It is common at Hitchin.

Candona candida, var. *tumida*, Brady & Robertson. — This variety has been found commonly in rivers and dykes subject to tidal influence. It differs from the typical form, so common in fresh water, in the shortness and the tumidity of the carapace. Another distinguishing character is the rosette-like arrangement of the muscle-spots, and this is clearly seen in at least one of the valves from Hitchin, where the variety is somewhat rare.

Candona candida, var. *claviformis*, Brady & Norman. — This variety has been taken in the living condition from canals and ponds. It is not unfrequent in the Pleistocene of Hitchin.

Family Darwinulidæ.

Darwinula Stevensoni, Brady & Robertson. — It is of much interest to note the occurrence of this species from Hitchin, since in the living state it is a characteristic form in the East Anglian Fen district; and it is also found in rivers, lochs, and canals in various parts of the British Islands. Several separate valves were found at Hitchin.

Family Cytheridæ.

Limnicythere inopinata (Baird). — This species is now found inhabiting ditches, lakes, and slowly-running streams. It has been recorded from various post-Tertiary clays of Scotland and England. It is of frequent occurrence in the fresh-water bed of Hitchin.

For valuable help in the writing of this account I tender my sincere thanks to Professor Rupert Jones.

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VIII.

FURTHER NOTE ON THE PALÆOLITHIC DEPOSITS AT HITCHIN.

By Clement Reid, F.R.S., F.L.S., F.G.S.

Communicated by John Hopkinson, F.L.S.

Read at Watford, 23rd April, 1901.

After the publication of my paper on the Palæolithic Deposits at Hitchin,* the plant-bearing stratum beneath the Palæolithic loam was again met with in a well a short distance from the brickyards. This well was fortunately observed by my friend Mr. William Hill, who procured some of the material thrown out and sent this to me with a note as to its position with regard to the exposures already described. The position of this well is 250 yards west of the boring which I made in Mr. Ransom's clay-pit, and Mr. Hill informs me that "The total depth of the well is 63 feet, and the section was as follows:—

		Feet.
	Soil, etc.	1
	Brickearth with a few small stones	29
Lake Bed	Yellowish calcareous loam with shells passing rather abruptly to	3–3½
Lake Bed	Very dark grey (almost black when wet) fine clayey silt with shells passing rapidly to	8–9
Lake Bed	Fine yellowish-grey loamy sand	22 (about)."

"The section of the 'Lake Bed' in the well," Mr. Hill adds, "showed a strong dip at the base."

The section agrees so closely with those already recorded that no remark need be made upon it, except that the uppermost 30 feet of strata evidently represent the Palæolithic loams seen in the brickyards. There is no sufficient evidence to prove whether the 22 feet of loamy sand should be assigned to the base of the lacustrine deposits or to the Glacial sand below.

The material received from Mr. Hill was a carbonaceous loam with seeds, fresh-water shells, and fish-bones. Most of the species have already been recorded; but the occurrence of various others new to the deposit, including several plants previously unknown in the fossil state, makes it worth while to supplement the published lists, though the new discoveries do not in any way modify the conclusions already arrived at. Mrs. Reid, who undertook the troublesome work of breaking down and examining the samples, found the deposit less tractable than the large proportion of sand would lead one to expect. The material was not easy to split along the bedding-planes, and would not go to pieces in water

* 'Proc. Royal Soc.,' vol. lxi, p. 40 (1897), and 'Trans. Herts Nat. Hist. Soc.,' Vol. X, p. 14 (1898).

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without much boiling and crushing. Leaves seem to be few and badly preserved, the fragments obtained being those of the oak only. Amongst the seeds and fruits the following are additions to the former list:—

Nymphæa alba, *L.*
Stellaria media, *Cyr.*
Heracleum Sphondylium, *L.*
Arctium Lappa, *L.*
Carduus nutans, *L.*
Lapsana communis, *L.*
Sonchus arvensis, *L.* (?)
Leontodon hirtus, *L.*
Solanum Dulcamara, *L.*
Mentha aquatica, *L.*
Prunella vulgaris, *L.*
Stachys palustris, *L.*
S. silvatica, *L.*
Alisma Plantago, *L.*
Zannichellia palustris, *L.*
Scirpus fluitans, *L.*

and an undetermined species of *Cnicus*.

To these may be added winter eggs of the entomostracan *Daphnia*; statoblasts of the fresh-water polyzoon *Cristatella mucedo*, Cuv.; and a tooth of a vole, according to Mr. E. T. Newton probably *Microtus arvalis* (not *M. agrestis*). The molluscs, fish-remains, and the rest of the plants belong to species already recorded.

The number of flowering plants identified from Hitchin now amounts to 29, and the total from the various deposits of the same date scattered over the southern half of England to about 140. Much yet remains to be done before we can claim to have a fair knowledge of either the fauna or the flora of this interesting period. The smaller fossils from the brickyard at Hitchin, especially the beetles, deserve more thorough collecting and study; but this is not work which can easily be undertaken by anyone living at a distance. I would particularly point to the fossil beetles as worthy of investigation, for Interglacial deposits in Canada yield a very peculiar coleopterous fauna, containing a very large proportion of extinct species. No one, however, has yet thoroughly examined the beetles found in the corresponding deposits in Britain, though elytra are of common occurrence.

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CONTENTS :

	PAGES
Meteorological Observations taken in Hertfordshire in the Year 1900. By John Hopkinson, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C.E.	65–74
List of the Lepidoptera of Cheshunt and its Neighbourhood. By W. C. Boyd, F.S.A.	75–86
List of Works on the Geology of Hertfordshire, 1884–1900. By John Hopkinson, F.L.S., F.G.S., etc.	87–104

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IX.

METEOROLOGICAL OBSERVATIONS TAKEN IN HERTFORDSHIRE IN THE YEAR 1900.

By JOHN HOPKINSON, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

THE only alteration which has taken place in the meteorological stations of Hertfordshire is the removal, on the last day of February, 1900, of the author's meteorological instruments from his residence, The Grange, St. Albans, to the Hertfordshire County Museum, a distance of one-eighth of a mile to the north-west and nine feet higher above sea-level. The thermometer-screen and rain-gauge are well exposed, being a sufficient distance from the Museum, and having an amply extensive clear space around them in every direction. The observations are taken by the caretaker of the Museum, Mr. Polman, under the supervision of the former observer, by whom the instruments have been presented to the County in the hope that a permanent Meteorological Observatory may thus be established.

All the observations have been taken as usual. The hour of observation is 9 a.m., and all the records are entered to the same day, except those of the maximum temperature and the rainfall, which are entered to the previous day. At Bennington, Berkhamsted, and St. Albans the shade-temperature thermometers are in Stevenson screens, in accordance with the regulations of the Royal Meteorological Society; at New Barnet they are under Glaisher stands.

TABLE I.—*Results of Climatological Observations taken in Hertfordshire in the Year* 1900.

Stations	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Bennington	49·3	42·0	56·7	14·7	13·1	90·1	81	7·2	23·30	197
Berkhamsted	49·3	41·4	57·3	15·9	11·0	89·9	82	6·9	28·91	186
St. Albans	49·3	42·2	56·4	14·2	16·6	89·6	81	6·5	27·50	194
New Barnet	49·4	39·6	59·2	19·6	9·0	93·9	81	6·0	24·82	162
County.....	49·3	41·3	57·4	16·1	9·0	93·9	81	6·6	26·13	185

The year 1900 was nearly as warm as the previous year, the mean temperature being a degree above the average of that of the twelve years 1887–98. The mean daily range of temperature was about the average, both days and nights being warmer than usual.

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The relative humidity was 1 per cent. less than the average, as in the previous year. The sky was of average brightness. The rainfall, also, was about the average, but the number of rainy days was very great, being 18 more than the average at all stations in the county for the thirty years 1870–99, and 29 more than that for the four climatological stations in the previous year. The maximum temperature, which occurred in July, was nearly as high as the highest on record for these stations.

TABLE II.—*Means of Climatological Observations (with Extremes of Temperature) for the Seasons of* 1899–1900.

Seasons	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Winter	36·9	31·5	42·3	10·8	9·0	58·5	91	7·8	9·42	57
Spring	45·2	36·5	53·9	17·4	15·0	76·0	77	6·5	2·96	35
Summer	61·7	51·8	71·7	19·9	36·1	93·9	73	6·1	6·60	38
Autumn	50·6	42·7	58·6	15·9	22·2	80·2	84	6·5	5·37	48

The Winter of 1899–1900 (Dec. to Feb.) was of about average temperature, and the mean daily range was about the same as usual. There were two rather cold periods, the 8th to 24th of December and the 1st to 15th of February, but there was no exceptionally cold weather. The air was rather humid, the sky rather cloudy, and the rainfall very heavy, being 80 per cent. above the average, and falling on 30 per cent. more than the usual number of days.

The Spring (March to May) was very cold, the days being a little more below the average temperature than the nights, the daily range therefore being a little smaller than the average. The air was rather drier than usual, the sky of average brightness, and the rainfall exceptionally small, being 41 per cent. below the average, but falling on nearly the usual number of days.

The Summer (June to August) was very warm, owing rather more to the warmth of the days than of the nights, the daily range being a little greater than usual. The only exceptionally warm period, however, was from the 10th to the 30th of July. The air was rather dry, the sky bright, and the rainfall a very little below the average, as also was the number of rainy days.

The Autumn (Sept. to Nov.) was also very warm, the nights being 1 degree and the days 2 degrees warmer than the average, the mean daily range of temperature therefore being considerable. The air was rather dry, the sky of average brightness, and the rainfall small, but there were more wet days than usual.

We thus had a very wet winter of average temperature, a very cold and dry spring, a very warm summer of nearly average rainfall, and a very warm and dry autumn. In the winter, however, December (1899) was rather dry and January was very mild; in

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the spring, April was rather warm; in the summer, July was the only exceptionally warm month; and the dryness of the autumn was owing entirely to the very small amount of rain which fell in September. March was the only month with the temperature much below the average, and July was the only month with it much above the average. In March and September the rainfall was exceptionally small; in January and February only was it much above the average.

TABLE III.—*Means of Climatological Observations (with Extremes of Temperature) taken at Bennington, Berkhamsted, St. Albans, and New Barnet, during the Year* 1900.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	38·7	33·4	43·9	10·5	17·5	53·9	91	7·9	3·32	21
Feb.	36·7	30·7	42·7	12·0	9·0	58·5	92	7·5	4·64	19
March	38·3	31·5	45·0	13·5	15·0	58·2	83	7·0	·74	10
April	46·7	36·5	56·9	20·4	18·5	76·0	74	5·8	1·11	14
May	50·7	41·6	59·8	18·2	27·0	74·0	74	6·8	1·11	11
June	58·9	49·6	68·2	18·6	40·8	89·5	76	6·9	2·57	16
July	65·8	54·1	77·4	23·3	36·1	93·9	66	4·8	1·15	8
August	60·5	51·6	69·4	17·8	41·1	86·2	76	6·5	2·88	14
Sept.	57·5	47·0	68·0	21·0	33·5	80·2	79	5·4	·75	7
Oct.	49·8	41·9	57·8	15·9	27·9	74·8	84	6·1	2·21	19
Nov.	44·6	39·2	50·0	10·8	22·2	64·0	90	8·0	2·39	22
Dec.	43·9	38·4	49·4	11·0	22·5	56·2	89	7·1	3·26	24
Year	49·3	41·3	57·4	16·1	9·0	93·9	81	6·6	26·13	185

JANUARY.—A mild month, rather humid, with a cloudy sky, and a very heavy rainfall on a large number of days. The mean temperature was about 2½° above the average, the excess being more due, by half a degree, to the warmth of the days than of the nights. A little snow fell about the middle of the month and towards the end. The temperature varied greatly, there being a few very cold days, but no prolonged period of cold weather. The four days 11th to 14th, and the last four or five days in the month, were very cold. The range of temperature on the 21st was very great, being about 24½° (25°·4 to 49°·8) at St. Albans, 26° (24° to 50°) at Berkhamsted, and 27° (23° to 50°) at Hertford. At St. Albans the 11th, 12th, and 13th were foggy, and there was a gale in the night of the 28th–29th. Mr. Mawley reports that "although such a continuously wet month, there was more than the usual amount of sunshine."

FEBRUARY.—Rather cold, very humid, with a rather cloudy sky, and an excessive rainfall on a large number of days. The mean temperature was 1° below the average, the defect being due a little

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more to cold days than cold nights. The first half of the month was very much colder than the last half. The minimum temperature was below 20° at St. Albans and Hertford on the 8th, 9th, 12th, and 13th, and at Berkhamsted on the 7th and 15th also, after which date it was never below 30°. The maximum was in the thirties for the first 14 days, and in the forties and fifties for the last 14, with one or two exceptions. Snow fell on several days during the first half of the month. On the 3rd the snow which fell during the previous night was 9 inches deep on the lawn at The Grange, St. Albans, and 10 inches at Rosebank, Berkhamsted, being the deepest fall, as Mr. Mawley states, "since January, 1887, or for 13 years." There was also a rather heavy fall of snow on the 10th and a very heavy one on the 13th, and Mr. Mawley estimates that about 20 inches in all fell during the first half of the month, after which there was no appreciable fall until the middle of March. A rapid thawing of the snow on frozen ground, and heavy rain on the 15th, caused serious floods in many places.

March.—A cold month, with an atmosphere of average humidity, a rather cloudy sky, and a very small rainfall on a considerable number of days for the quantity recorded. The day temperatures averaged 4° lower than usual, the daily range being small for March. The 18th was a very cold day. At St. Albans, at 9 a.m., the temperature was 25°·8, and the minimum for the previous night was 21°·5; at Berkhamsted and Hertford it was 20°. Although so little rain fell, March was a rather sunless month, the sun shining on the average only 3 hours a day at Berkhamsted and 3½ hours at Bennington.

April.—Of about average temperature, with a very dry atmosphere, a bright sky, and a small rainfall, but more than the usual number of wet days. The range of temperature was rather greater than usual, chiefly owing to the warmth of the days. The first three days were rather cold, and the minimum was low on the 9th and 26th. The four days 19th to 22nd were unusually warm and bright, and Mr. Mawley states that the 21st was "much warmer than an average day in July." Towards the end of the month the weather became cooler. The sun shone for nearly seven hours a day at Bennington and six at Berkhamsted—a high record.

May.—Rather cold, with a rather dry atmosphere, a cloudy sky, and a small rainfall on the average number of days. The low temperature was chiefly due to the coldness of the days, the range of temperature being smaller than usual. There was no day nearly so cold nor nearly so warm as there was in April at Bennington, Berkhamsted, or St. Albans, but there was not much difference between the maximum temperature in the two months at New Barnet. The weather was warm for the first eight days, cold from the 9th to the 20th, when it again became warm for a couple of days, after which it was very variable. The prevailing winds were north-easterly. There was a little less sunshine than usual. On the 28th there was a partial eclipse of the sun, which did not cause any appreciable lowering of the temperature.

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TABLE IV.— *Climatological Observations taken at* BENNINGTON HOUSE, BENNINGTON. *Latitude:* 51° 53′ 45″ N. *Longitude:* 0° 5′ 20″ W. *Altitude:* 407 *feet. Observer:* REV. J. D. PARKER, LL.D., F.R.Met.Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	38·6	33·9	43·2	9·3	25·1	51·3	92	8·2	2·67	21
Feb.	36·5	31·3	41·8	10·5	13·1	56·1	91	7·9	3·91	18
March	37·9	31·8	44·0	12·2	20·3	56·4	84	7·6	·66	10
April	46·9	37·6	56·2	18·6	24·9	73·8	75	6·1	1·21	14
May	50·5	42·1	58·8	16·7	33·9	68·7	73	7·7	1·08	12
June	58·8	50·2	67·5	17·3	44·2	84·1	75	7·7	2·40	16
July	66·0	55·1	76·9	21·8	44·8	90·1	63	5·3	1·03	8
August	60·5	52·0	68·9	16·9	46·2	83·3	76	6·9	2·89	16
Sept.	58·1	48·8	67·4	18·6	42·6	78·7	78	5·9	·59	9
Oct.	49·7	42·1	57·3	15·2	34·4	71·8	83	6·9	2·07	23
Nov.	44·4	39·8	49·1	9·3	29·0	60·4	92	8·2	1·94	23
Dec.	44·0	38·7	49·2	10·5	25·4	56·2	91	7·7	2·85	27
Year	49·3	42·0	56·7	14·7	13·1	90·1	81	7·2	23·30	197

TABLE V.— *Other Meteorological Observations taken at Bennington by the Rev. Dr. Parker.*

Months	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	29·960	36·7	35·9	38·3	39·3	1	18	47	6·2	13
Feb.	·615	34·9	34·0	36·8	37·5	2	18	75	8·8	9
March	30·049	37·1	35·3	39·4	40·2	4	15	111	10·7	7
April	·015	47·0	43·5	45·9	45·6	6	12	202	13·3	0
May	·015	51·2	47·2	51·9	51·5	1	16	186	12·2	2
June	29·963	59·2	55·0	58·8	57·8	2	18	196	15·2	1
July	30·028	67·7	60·4	65·8	64·5	8	9	288	15·3	0
August	29·986	60·3	56·3	62·3	62·7	4	12	191	13·3	2
Sept.	30·157	58·2	54·6	59·3	60·0	7	6	183	12·5	0
Oct.	·000	50·4	48·0	51·3	52·9	2	10	139	10·0	3
Nov.	29·788	49·6	42·7	46·4	47·6	0	16	47	7·7	16
Dec.	·944	43·3	42·1	44·0	46·2	1	15	50	6·3	16
Year	29·960	49·1	46·3	50·0	50·4	38	165	1715	15·3	69

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JUNE.—Of average temperature, rather humid, with a little more cloud than usual, and a rather heavy rainfall on a large number of days. The days were colder and the nights warmer than usual, the range of temperature being rather small for the month. For the first two days the weather was cold, for the next week it was decidedly warmer, and it was very warm on the 10th, 11th, and 12th, the 11th being the hottest day since the 25th of August, 1899. The mean temperature of the three days was 66°·2 at Berkhamsted, 67°·6 at St. Albans, and 67°·3 at Hertford; and on the 11th it was 69°·5 at Berkhamsted, 70°·9 at St. Albans, and 70°·5 at Hertford. It was the day of maximum temperature, as shown in the tables, at all stations, and it is the earliest day in the month at which such high temperatures have been recorded at any of them. Thunderstorms passed over the county in the morning, the afternoon, and the evening of the 12th. Mr. Mawley reports that at Berkhamsted in the morning the rain fell for one minute "at the very exceptional rate of over 2½ inches in an hour," and in the afternoon rain and hail fell for four minutes at the rate of nearly 2 inches an hour. During the morning's storm the "True Blue" public-house, at Buck's Hill near Chipperfield, was struck by lightning. The current of electricity first threw down a large chimney, then, passing through a bedroom, loosened the grate and ripped pieces out of an iron bedstead; it then made a large hole in the floor and passed into the bar below, found its way down a bottle of wine, took the lip off a quart measure, and "made a hole in the side as if a Mauser bullet had been shot straight through it." There was another thunderstorm on the 25th, when the tower of Little Hallingbury Church near Bishop's Stortford was struck by lightning and damaged; and in Winch Hill Wood near King's Walden an ash-tree was rooted up and completely wrecked by the lightning, long thin splinters being thrown in thick profusion for many yards around the tree.

JULY.—An exceptionally warm month, with a very dry atmosphere, an unusually bright sky, and a small rainfall on a very small number of days. The high mean temperature was more than twice as much due to the warmth of the days (6½° above the average) than to that of the nights. The maximum temperature, which varied at the different stations from about 88° to 94°, was about the same on the 19th, 20th, and 25th, and at New Barnet was 3° higher than the highest recorded there in July for at least 18 years, and higher than any previous record for the county. It is probably not only the hottest July on record but also the one with the driest atmosphere and the brightest sky. At Berkhamsted the sun shone on the average for 8¼ hours a day and at Bennington for 9¼ hours. There were severe thunderstorms on the 3rd, 16th, and 27th. That on the 3rd passed over Welwyn at about 5.15 p.m., the rain there being very heavy and large hailstones falling fast. The storm on the 16th was a very peculiar one: about an inch of rain fell in the north and west of the county, but in the east and south there was a dust-storm without rain. This is reported from

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TABLE VI. — *Climatological Observations taken at* ROSEBANK, BERKHAMSTED. *Latitude :* 51° 45′ 40″ N. *Longitude :* 0° 33′ 30″ W. *Altitude :* 400 *feet. Observer :* EDWARD MAWLEY, F.R.Met. Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	39·2	34·0	44·3	10·3	24·2	52·6	93	8·5	3·92	22
Feb.	36·5	30·6	42·4	11·8	11·0	56·9	93	7·8	5·50	19
March	38·2	31·7	44·7	13·0	20·5	57·3	85	6·9	·80	12
April	46·5	36·2	56·8	20·6	24·1	75·5	72	6·5	1·02	15
May	50·6	41·6	59·6	18·0	31·1	69·0	70	6·6	1·09	12
June	58·7	49·7	67·7	18·0	43·4	85·9	74	7·2	2·13	15
July	65·4	53·9	77·0	23·1	41·7	89·9	66	5·2	1·89	9
August	60·6	51·8	69·3	17·5	44·2	82·9	78	7·0	3·32	13
Sept.	57·4	46·7	68·1	21·4	37·6	77·5	80	5·8	·69	6
Oct.	49·7	41·9	57·6	15·7	31·7	70·6	86	6·5	2·32	17
Nov.	44·8	39·7	49·8	10·1	26·2	61·1	94	8·2	2·80	22
Dec.	44·5	39·3	49·7	10·4	26·6	56·1	91	6·8	3·43	24
Year	49·3	41·4	57·3	15·9	11·0	89·9	82	6·9	28·91	186

TABLE VII. — *Other Meteorological Observations taken at Berkhamsted by Mr. Mawley.*

Months	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	29·937	36·9	36·1	37·3	39·1	2	18	45	6·3	14
Feb.	·584	34·9	34·0	36·1	37·4	2	16	53	7·6	13
March	30·029	37·0	35·3	39·6	41·2	5	16	96	9·3	5
April	29·997	47·4	43·4	47·0	46·7	4	9	178	12·1	0
May	·995	51·7	47·0	53·8	53·1	0	12	170	12·0	3
June	·940	59·1	54·6	60·9	59·6	0	13	171	13·5	1
July	30·014	67·0	60·4	66·8	65·2	8	6	258	13·8	1
August	29·968	60·0	56·3	63·8	64·5	5	8	185	13·2	2
Sept.	30·146	58·0	54·8	59·9	61·2	8	7	167	10·5	0
Oct.	29·986	49·6	47·6	51·3	54·0	5	9	118	8·8	2
Nov.	·750	43·5	42·8	45·9	48·2	0	15	43	6·8	14
Dec.	·914	43·2	42·0	43·4	45·0	2	15	35	5·2	18
Year	29·938	49·0	46·2	50·5	51·3	41	144	1519	13·8	73

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Rickmansworth, Watford, St. Albans, Hatfield, Hertford, Ware, and Buntingford, a little rain or hail being recorded at St. Albans and Buntingford only in the region of the dust-storm. The dust was carried up and round as in a whirlwind, fields were cleared of hay, which was deposited in adjoining fields, haystacks were blown down, fruit-trees laden with fruit were lifted out of the ground, and in some places, as at Ware and Buntingford, larger trees were uprooted. At Rickmansworth windows were blown in and other damage was done to buildings. At Watford it was noticed that the higher clouds were travelling in a north-easterly direction and the lower ones very rapidly southwards. This was at half-past 1, and at about the same time heavy rain began to fall in the neighbourhood of Baldock, Hitchin, Kensworth, and Berkhamsted, as recorded in my Report on the Rainfall (see p. 41). The roads in the low-lying parts of Hitchin were flooded in some places to the depth of nearly 2 feet. On the 27th there were three distinct thunderstorms between 2 and 10 p.m. The last was the most severe, and was at its height at 8 at Berkhamsted and just before 10 at Watford. In the neighbourhood of Hertford several trees were struck by the lightning, and at Watford three houses; and in the neighbourhood of Rickmansworth several stacks were set on fire and standing crops were beaten to the ground.

August.—A month of average temperature, humidity, and cloud, with a heavy rainfall on about the usual number of days. The nights were rather warmer and the days rather cooler than usual. The temperature varied greatly, the first and the last 10 days being rather cool, and the middle of the month (11th to 21st) very warm. At Berkhamsted, St. Albans, and Hertford during the two cool periods there were no maximum readings above 70° except on the 31st, and at Hertford only on the 2nd; and during the warm period there was not one below 70° except on the 21st at St. Albans, and then only just below it, while 80° was exceeded at one or more of these places on the 12th, 13th, 14th, and 18th. There were thunderstorms, or thunder was at least heard, nearly every day from the 18th to the 25th. The cool periods were also for the most part wet and sunless, while no rain fell from the 11th to the 20th, and at Berkhamsted the sun "shone brightly on an average for nearly 11 hours a day." There was a gale on the 3rd which did much damage to trees. Several, including some very fine ones, were blown down at Hemel Hempstead, Boxmoor, and Apsley End; at Hertford six trees were blown down in one meadow alone adjoining the river Beane, and at Hoddesdon several fine elms by the side of the New River succumbed to the force of the gale, and also other trees in the neighbourhood, near Stanstead Pond and at the Rye House. The fruit-crop suffered greatly, large quantities of apples and plums still green being blown off the trees. On the 6th (Bank Holiday) the gale was renewed, the neighbourhood of Hitchin, where several trees were uprooted, suffering the most. A lunar rainbow was seen on the night of Sunday the 5th. It was only reported from the east of the county.

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TABLE VIII.—*Climatological Observations taken at the* HERTFORDSHIRE COUNTY MUSEUM, ST. ALBANS.* *Latitude:* 51° 45′ 15″ N. *Longitude:* 0° 19′ 56″ W. *Altitude:* 389 *feet. Observer:* JOHN HOPKINSON, F.R.Met.Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	38·5	33·4	43·6	10·2	25·4	51·6	91	8·0	3·59	21
Feb.	36·6	31·3	42·0	10·7	16·6	56·9	91	7·1	4·87	20
March	38·5	32·2	44·8	12·6	21·5	55·1	83	6·8	·83	11
April	46·8	38·3	55·3	17·0	25·4	73·7	75	5·4	1·29	15
May	50·4	42·5	58·4	15·9	33·2	67·5	75	6·4	1·10	12
June	58·3	50·2	66·4	16·2	43·7	84·4	76	6·6	2·95	18
July	65·7	55·5	75·9	20·4	43·8	89·6	66	4·8	·93	8
August	60·4	53·1	67·8	14·7	46·6	82·2	77	6·5	3·11	14
Sept.	57·5	48·6	66·3	17·7	40·9	76·9	79	5·5	·73	7
Oct.	50·0	43·1	56·9	13·8	34·9	70·9	83	6·2	2·19	21
Nov.	44·6	39·7	49·5	9·8	28·0	58·9	89	8·0	2·29	23
Dec.	44·3	38·7	49·8	11·1	26·8	54·8	88	7·0	3·62	24
Year	49·3	42·2	56·4	14·2	16·6	89·6	81	6·5	27·50	194

* At The Grange, St. Albans, in January and February.

TABLE IX.—*Climatological Observations taken at the* GAS WORKS, NEW BARNET. *Latitude:* 51° 39′ 5″ N. *Longitude:* 0° 10′ 15″ W. *Altitude:* 212 *feet. Observer:* T. H. MARTIN, Assoc. M. Inst. C.E.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	38·4	32·3	44·5	12·2	17·5	53·9	87	6·7	3·09	21
Feb.	37·1	29·6	44·6	15·0	9·0	58·5	92	7·1	4·27	18
March	38·6	30·4	46·7	16·3	15·0	58·2	81	6·9	·68	8
April	46·6	34·0	59·3	25·3	18·5	76·0	75	5·3	·94	11
May	51·3	40·0	62·5	22·5	27·0	74·0	76	6·5	1·18	9
June	59·8	48·3	71·4	23·1	40·8	89·5	78	5·9	2·79	16
July	66·0	52·1	79·9	27·8	36·1	93·9	68	3·9	·74	7
August	60·5	49·4	71·7	22·3	41·1	86·2	75	5·6	2·20	11
Sept.	57·0	43·8	70·1	26·3	33·5	80·2	80	4·6	·97	6
Oct.	49·9	40·3	59·4	19·1	27·9	74·8	84	4·9	2·27	15
Nov.	44·7	37·8	51·7	13·9	22·2	64·0	87	7·4	2·54	19
Dec.	42·8	36·9	48·7	11·8	22·5	56·1	87	6·8	3·15	21
Year	49·4	39·6	59·2	19·6	9·0	93·9	81	6·0	24·82	162

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SEPTEMBER. — Rather warm, with a dry atmosphere, an exceedingly bright sky, and a very small rainfall on very few days. The mean night temperature was a little below the average, but the mean day temperature considerably above it, giving a large daily range. In most parts of the county no appreciable amount of rain fell until the 24th. Unlike the three Summer months, the first month of Autumn was a calm and genial one without storms and with a fairly equable temperature throughout.

OCTOBER. — A warm month, with a dry atmosphere, a rather bright sky, and a rainfall rather below the average (for which October has a high one), but on more than the usual number of days. The excess of temperature was due twice as much to the high day temperature as to the high night temperature, the mean daily range therefore being considerable. The temperature was very variable: at St. Albans in the first half of the month the minimum ranged from 36°·4 on the 4th to 56°·3 on the 7th, and the maximum from 49°·4 on the 14th to 70°·9 on the 8th, a very high reading for so late in the year; and in the second half the minimum ranged from 34°·9 on the 28th to 52°·0 on the 25th, and the maximum from 48°·6 on the 21st to 61°·5 on the 17th. Strong westerly winds prevailed for much the greater part of the month.

NOVEMBER. — Rather warm, with an atmosphere of average humidity, a very cloudy sky, and about an average rainfall, but on an unusually large number of wet days. The night temperatures were rather more above the average than the day temperatures, the daily range being smaller than usual. At St. Albans rain fell every day but the 2nd, 10th, 18th, 19th, 22nd, 23rd, and 25th, but the amount only exceeded a tenth of an inch on seven days and never reached half an inch in any one day.

DECEMBER.—A very mild month, with an atmosphere of nearly the average humidity, a sky of average brightness, and a very heavy rainfall on a large number of days. Both the days and the nights were about 6° warmer than usual, the mean daily range of temperature being about the average. The amount of rain and the number of wet days were 50 per cent. above the average for the twelve years 1887–98. At St. Albans the only days without rain were the 11th, 14th, 16th, 17th, 21st, 22nd, and 23rd, the same number (seven) as in November. There was only one cold period, of very short duration, the three days 22nd to 24th, the mean temperature of which was at Berkhamsted 33°·7, at St. Albans 34°·9, and at Hertford 34°·4. These days, although not unseasonably cold, thus had a mean temperature about 10° below the average of the month. The wind was westerly or south-westerly almost throughout the month, and on the evening of the 5th reached the force of a gale.

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X.

LIST OF THE LEPIDOPTERA OF CHESHUNT AND ITS NEIGHBOURHOOD.

By W. C. Boyd, F.S.A.

Communicated by A. E. Gibbs, F.L.S.

Read at Watford, 23rd April, 1901.

The following list of Lepidoptera is the result of 50 years' observations in the vicinity of Cheshunt. No doubt I could have added a few more species had I been able to devote more time to collecting. Nevertheless, I think that it is a fair approximation to a complete catalogue of the Lepidoptera which occur in this neighbourhood.

The neighbourhood of Cheshunt offers considerable advantages to the entomologist. On the east there is the long extent of marsh-land which runs from Hackney northwards to Hertford and Bishop's Stortford, and on the north and west there are a good many woods, while at the Pollards near Wormley West End, on the north, there is a most excellent little patch of heather, mixed with *Genista anglica*, bracken, and bushes of oak and poplar.

One thing has struck me very forcibly with regard to the distribution of the species, and that is how an insect (not usually local) may sometimes be common at one place and yet within a mile and a half may be practically absent.

For instance, during the last 40 years I have sugared pretty regularly in three gardens, namely, at my father's house in Cheshunt Street for 18 years; then three-quarters of a mile farther south, at College Road, for 14 years; and lastly, another half-mile farther south, in Crossbrook Street, for 9 years. Taking four well-known species, *Hydræcia nictitans*, *Noctua umbrosa*, *Anchocelis litura*, and *Hadena protea*, I found that at Cheshunt Street *N. umbrosa* was fairly common, *H. nictitans* and *H. protea* were absent, and *A. litura* was represented by only two specimens; at College Road a few specimens of *H. protea* and *H. nictitans* occurred, but I think not one of *A. litura* nor *N. umbrosa*; while at Crossbrook Street there was any number of *H. nictitans*, *A. litura*, and *H. protea*, but not a single *N. umbrosa*.

There are other species which are evidently of similar local occurrence, without, so far as I am aware, any reason for it in regard to soil or food-plant.

The names in italics are those of varieties.

RHOPALOCERA (Butterflies).

Pieris
brassicæ.—Common.
rapæ.—Common.
napi.—Common.

Anthocharis
cardamines.—Common.

Gonepteryx
rhamni.—Scarce.

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Colias
edusa.—Occasionally.
helice.—One specimen, New River Reservoirs.
Vanessa
urticæ.—Common.
polychloros.—Sometimes common.
io.—Common.
atalanta.—Common.
cardui.—Sometimes common.
Satyrus
megæra.—Common.
janira.—Common.
tithonus.—Common.
hyperanthus.—Common, Cheshunt Marsh.
Chortobius
pamphilus.—Common.
Theela
quercus.—Broxbourne Woods.
w-album.—Twice at Cheshunt.
Polyommatus
phlæas.—Common.
Lycæna
alexis.—Common.
corydon.—One at Turnford.
argiolus.—Common.
Syrichthus
alveolus.—Broxbourne Woods.
Thanaos
tages.—Broxbourne Woods.

HETEROCERA (Moths).

NOCTURNI.

Procris
statices.—Local around Goff's Oak.
Zygæna
trifolii.—Local, Cheshunt and Bayford.
filipendulæ.—Common.
Smerinthus
ocellatus.—Common.
populi.—Common.
tiliæ.—Common.
Acherontia
atropos.—Occasionally taken.
Sphinx
convolvuli.—Occasionally taken, Cheshunt Street.
ligustri.—Scarce.
Deilephila
galii.—One at Cheshunt Street, 12th August, 1870.
lineata.—One at Cheshunt Street, 25th August, 1868.
Chœrocampa
celerio.—One at Waltham Cross.
porcellus.—Occasionally.
elpenor.—Common.
Macroglossa
stellatarum.—Common.
fuciformis.—Broxbourne Woods.
Sesia
myopiformis.—Common.
formiciformis.—Cheshunt Marsh.
cynipiformis.—Bayford.
tipuliformis.—Common.
bembeciformis.—One near Cheshunt Station.
Zeuzera
æsculi.—Common.
Cossus
ligniperda.—Very common.
Hepialus
hectus.—Scarce.
lupulinus.—Common.
sylvinus.—Common.
humuli.—Common.
Nola
cucullatella.—Common.
Nudaria
mundana.—Local.
Calligenia
miniata.—Scarce.
Lithosia
complanula.—Common.
griseola.—Common.
stramineola.—One, Cheshunt Street, cir. 1857.
Chelonia
caja.—Common.
villica.—Scarce, only one or two specimens.
Arctia
fuliginosa.—Scarce.
mendica.—Scarce.
lubricipeda.—Common.
menthastri.—Common.
urticæ.—Scarce, Cheshunt Marsh.
Liparis
auriflua.—Common.
salicis.—Scarce.
Orgyia
antiqua.—Common.
Demas
coryli.—One, Theobald's Grove Station.
Trichiura
cratægi.—Scarce around Cheshunt.
Pœcilocampa
populi.—Scarce around Cheshunt.
Eriogaster
lanestris.—One brood, Cheshunt Wash.

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Bombyx
neustria.—Common around Chesh.
quercus.—Scarce around Cheshunt.
Odonestis
potatoria.—Common around Chesh.
Lasiocampa
quercifolia.—Occurs at light most years around Cheshunt.
Saturnia
carpini.—Common around Cheshunt.

GEOMETRÆ.

Urapteryx
sambucata.—Common around Chesh.
Epione
apiciaria.—Common, Chesh. Marsh.
Rumia
cratægata.—Common around Chesh.
Metrocampa
margaritata.—Occasionally, Chesh. and Waltham Cross.
Ellopia
fasciaria.—Scarce, Waltham Cross.
Pericallia
syringaria. — Occasionally around Cheshunt.
Selenia
illunaria.—Common around Chesh.
lunaria.—Once at light, Cheshunt Station.
illustraria.—Once at light, Cheshunt Station.
Odontopera
bidentata.—Once, Burton Grange, Cheshunt.
Crocallis
elinguaria.—Common around Chesh.
Ennomos
tiliaria.—Common around Cheshunt.
fuscantaria.—Scarce around Chesh.
angularia.—Scarce around Cheshunt.
Himera
pennaria.—Common around Chesh.
Phigalia
pilosaria.—Common around Chesh.
Nyssia
hispidaria.—Once at light, Cheshunt Station.
Biston
hirtaria.—Scarce around Cheshunt.
Amphidasis
prodromaria.—Scarce around Chesh.
betularia.—Scarce around Cheshunt.
Hemerophila
abruptaria.—Scarce around Chesh.
Cleora
lichenaria.—Once, Cheshunt Street.
Boarmia
repandata.—Scarce, Cheshunt.
rhomboidaria. — Common around Cheshunt.
Tephrosia
consonaria.—Broxbourne Woods.
crepuscularia. — Scarce, Waltham Cross.
extersaria.—Broxbourne Woods.
Geometra
papilionaria.—Occasionally, Cheshunt Marsh.
Iodis
lactearia.—Common around Chesh.
Phorodesma
bajularia. — Once, College Road, Cheshunt.
Hemithea
thymiaria.—Common around Chesh.
Asthena
luteata.—Scarce, Hammond Street, Flamstead End.
candidata.—Common, Brox. Woods.
Acidalia
scutulata.—Common around Chesh.
bisetata.—Common around Chesh.
osseata.—Common around Chesh.
incanaria.—Common.
remutata.—Broxbourne Woods.
imitaria.—Common around Chesh.
aversata.—Common around Chesh.
emarginata. — Common, Flamstead End.
Timandra
amataria.—Common around Chesh.
Cabera
pusaria.—Common around Cheshunt
exanthemaria. — Common around Cheshunt.
Halia
wavaria.—Common around Cheshunt
Panagra
petraria.—Broxbourne Woods.
Abraxas
grossulariata. — Common around Cheshunt.
Ligdia
adustata. — Turnford and Burton Grange, Cheshunt.
Lomaspilis
marginata.—Common around Chesh.
Hybernia
rupicapraria. — Common around Cheshunt.
leucophearia.—Wormley.
progemmaria. — Common around Cheshunt.
defoliaria.—Common around Chesh.
Anisopteryx
æscularia.—Common around Chesh.
Cheimatobia
brumata.—Common around Chesh.
Oporabia
dilutata.—Common around Chesh.

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Larentia
didymata.—Common around Chesh.
pectinitaria.—Broxbourne Woods.
Emmelesia
albulata.—Common locally around Cheshunt.
decolorata.—Halfhide Lane, Cheshunt Wash.
Eupithecia
venosata.—Scarce around Cheshunt.
linariata.—Has occurred in Broxbourne Woods.
centaureata. — Common around Cheshunt.
succenturiata.—Scarce around Chesh.
subfulvata.—Common around Chesh.
satyrata.—Scarce around Cheshunt.
castigata.—Common around Chesh.
albipunctata.—Sometimes common, Cheshunt Marsh.
fraxinata. — Has occurred twice, Cheshunt and Turner's Hill.
subnotata. — Common, Waltham Cross.
vulgata.—Common around Cheshunt
absinthiata.—Common around Ches.
assimilata.—Common around Chesh.
abbreviata.—Scarce around Cheshunt
exiguata.—Scarce around Cheshunt.
sobrinata.—Scarce around Cheshunt
coronata.—Scarce, Waltham Cross.
rectangulata. — Common around Cheshunt.
Thera
simulata.—Common around Chesh.
firmata.—Scarce around Cheshunt.
Hypsipetes
elutata.—Common around Cheshunt.
Melanthia
ocellata.—Common around Chesh.
albicillata.—Once, Waltham Cross.
Melanippe
unangulata.—Scarce, Chesh. Marsh.
rivata.—Scarce, Cheshunt Marsh.
subtristata.—Common around Chesh.
montanata.—Common around Chesh.
fluctuata.—Common around Chesh.
Anticlea
badiata.—Common around Cheshunt
derivata.—Burton Grange, Cheshunt.
Coremia
propugnata.—Common, Theobalds.
ferrugata.—Common around Chesh.
unidentaria.—Common.
Camptogramma
bilineata.—Common around Chesh.
Phibalapteryx
lignata.—Has occurred, Cheshunt Marsh.
vitalbata.—Once, Cheshunt Street.
Scotosia
dubitata.—Scarce, Cheshunt Street.
certata. — Once, Kilsmore Lane, Cheshunt.
Cidaria
miata.—Scarce around Cheshunt.
picata.—Once, Church Gate, Chesh.
russata.—Common around Chesh.
immanata.—Common around Chesh.
suffumata.—Scarce around Chesh.
testata.—Common around Cheshunt.
fulvata.—Common around Cheshunt.
pyraliata.—Common around Chesh.
dotata.—Common around Cheshunt.
Eubolia
cervinaria.—Common around Chesh.
mensuraria. — Common, Cheshunt Marsh.
Anaitis
plagiata.—Common around Chesh.
Chesias
spartiata.—Carnell's Green, Broxb.

DREPANULÆ.

Platypteryx
hamula.—Once, Waltham Cross.
Cilix
spinnla.—Common around Cheshunt.

PSEUDO-BOMBYCES.

Dicranura
furcula.—Scarce around Cheshunt.
bifida.—Scarce around Cheshunt.
vinula.—Common around Cheshunt.
Stauropus
fagi.—One, Base Hill, Broxbourne Woods.
Pygæra
bucephala.—Common around Chesh.
Clostera
reclusa.—Scarce, Cheshunt Marsh.
Ptilodontis
palpina.—Scarce around Cheshunt.
Notodonta
camelina.—Scarce around Cheshunt.
dictæa.—Scarce, Cheshunt Marsh.
ziczac.—Scarce around Cheshunt.
Diloba
cæruleocephala. — Common around Cheshunt and Bayford.

NOCTUÆ.

Thyatira
derasa.—Scarce around Cheshunt.
Cymatophora
ocularis.—Once at Waltham Cross, 1901.
ridens.—Scarce, Theobalds and Broxbourne Woods.
Bryophila
perla.—Common around Cheshunt.

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Acronycta
tridens.—Scarce, Cheshunt Street.
psi.—Common around Cheshunt.
aceris.—Scarce around Cheshunt.
megacephala.—Scarce around Chesh.
alni.—One larva, Church Gate.
rumicis.—Scarce around Cheshunt.

Leucania
conigera.—Common around Chesh.
lithargyria.—Common around Chesh.
comma.—Common around Cheshunt.
impura.—Common around Cheshunt.
pallens.—Common.

Nonagria
despecta.—Scarce, Cheshunt Marsh.
fulva.—Scarce.
typhæ.—Common around Cheshunt.

Gortyna
flavago.—Scarce around Cheshunt.

Hydræcia
nictitans.—Common, Waltham Cross.
micacea.—Common around Cheshunt

Xylophasia
rurea.—Scarce around Cheshunt.
lithoxylea.—Common around Chesh.
polyodon.—Common around Chesh.
hepatica.—Common around Chesh.

Dipterygia
pinastri. — Sometimes common, Waltham Cross.

Heliophobus
popularis.—Common around Chesh.

Cerigo
cytherea.—Scarce around Cheshunt.

Luperina
testacea.—Common around Cheshunt
cespitis.—Scarce around Cheshunt.

Mamestra
anceps.—Scarce around Cheshunt.
brassicæ.—Common around Chesh.
persicariæ.—Common around Chesh.

Apamea
gemina.—Scarce, Cheshunt Marsh.
unanimis.—Common, Chesh. Marsh.
oculea.—Common around Cheshunt.

Miana
strigilis.—Common around Chesh.
fasciuncula. — Common, Cheshunt Marsh.
furuncula.—Common around Chesh.
arcuosa.—Local around Cheshunt.

Grammesia
trilinea.—Common around Chesh.
bilinea.—Scarce around Cheshunt.

Caradrina
morpheus.—Common around Chesh.
alsines.—Scarce around Cheshunt.
blanda.—Common around Cheshunt.
cubicularis.—Common around Chesh.

Rusina
tenebrosa.—Scarce around Cheshunt.

Agrotis
puta.—Scarce, Waltham Cross.
suffusa.—Scarce around Cheshunt.
saucia.—Occasionally around Chesh.
segetum.—Common around Chesh.
exclamationis. — Common around Cheshunt.
nigricans.—Scarce around Cheshunt.
tritici.—Once at Waltham Cross.
ravida.—Very scarce around Chesh.

Triphæna
janthina.—Scarce around Cheshunt.
fimbria.—Scarce around Cheshunt.
interjecta.—Common around Chesh.
orbona.—Common around Cheshunt.
pronuba.—Common around Chesh.

Noctua
augur.—Used to be common, Cheshunt Street.
plecta.—Common around Cheshunt.
c-nigrum.—Common around Chesh.
triangulum.—Scarce around Chesh.
rhomboidea.—Once, Waltham Cross.
rubi.—Common around Cheshunt.
umbrosa.—Used to occur, Cheshunt Street.
xanthographa. — Common around Cheshunt.

Tæniocampa
gothica.—Common around Cheshunt
rubricosa.—Scarce, Chesh. Marsh.
instabilis.—Common around Chesh.
populeti.—Once, Cheshunt Marsh.
stabilis.—Common around Chesh.
gracilis.—Common around Chesh.
cruda.—Common around Cheshunt.

Orthosia
ypsilon.—Common around Chesh.
lota.—Common around Cheshunt.

Anchocelis
pistacina.—Common around Chesh.
lunosa.—Common.
litura.—Common.

Cerastis
vaccinii.—Common.
spadicea.—Common.

Xanthia
citrago.—Scarce around Cheshunt.
cerago.—Common around Cheshunt.
silago.—Scarce around Cheshunt.
gilvago.—Common, Waltham Cross.
ferruginea.—Common around Chesh.

Cirrhœdia
xerampelina.—Scarce around Chesh.

Tethea
subtusa.—Once, Waltham Cross.
retusa.—Scarce, Cheshunt Marsh.

Cosmia
trapezina.—Common around Chesh.
diffinis.—Scarce around Cheshunt.
affinis.—Scarce around Cheshunt.

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Dianthœcia
capsincola.—Common around Chesh.
cucubali.—Scarce around Cheshunt.
Hecatera
dysodea.—Scarce, Cheshunt Street.
serena.—Scarce around Cheshunt.
Polia
flavicincta.—Scarce, Cheshunt Street
Epunda
viminalis.—Scarce, Cheshunt Marsh, and Waltham Cross.
Miselia
oxyacanthæ.—Common around Ches.
Agriopis
aprilina.—Scarce around Cheshunt.
Phlogophora
meticulosa.—Common around Chesh.
Euplexia
lucipara. — Sometimes common around Cheshunt.
Aplecta
advena.—Two at Waltham Cross, 1900.
Hadena
proteus.—Sometimes common, Waltham Cross.
dentina.—Scarce around Cheshunt.
chenopodii. — Sometimes common, Waltham Cross.
oleracea.—Common around Chesh.
genistæ.—Very scarce around Chesh.
Xylocampa
lithorhiza.—Common around Chesh.
Calocampa
exoleta.—One, Cheshunt Marsh.
Cucullia
verbasci.—Common around Chesh.
chamomillæ.—Scarce around Chesh.
umbratica.—Common around Chesh.
Heliodes
arbuti.—Common around Cheshunt.
Habrostola
urticæ.—Common around Cheshunt.
triplasia.—Common around Chesh.
Plusia
moneta.—Two, Waltham Cross, 1900, and one, 1901.
chrysitis.—Common around Chesh.
iota.—Common around Cheshunt.
v-aureum.—Common around Chesh.
gamma.—Common around Cheshunt
interrogationis. — Once, Cheshunt Street.
Gonoptera
libatrix.—Common around Cheshunt
Amphipyra
pyramidea.—Common around Chesh.
tragopogonis. — Common around Cheshunt.
Mania
typica.—Common around Cheshunt.
maura.—Common around Cheshunt.
Catocala
fraxini.—Has been seen, Waltham Cross.
nupta.—Common around Cheshunt.
Euclidia
mi.—Scarce around Cheshunt.
Phytometra
ænea.—Broxbourne Woods.

DELTOIDES.

Hypena
proboscidalis. — Common around Cheshunt.
rostralis.—Common around Cheshunt
Herminia
tarsipennalis. — Common around Cheshunt.
grisealis.—Common around Chesh.
Aventia
flexula.—Has occurred, Bayford and Cheshunt.

PYRALIDES.

Pyralis
fimbrialis.—Common around Chesh.
farinalis.—Common around Chesh.
glaucinalis.—Common around Chesh.
Aglossa
pinguinalis.—Common around Ches.
cuprealis.—Scarce around Cheshunt.
Pyrausta
purpuralis.—Common around Chesh.
Herbula
cespitalis.—Common, Brox. Woods.
Endotricha
flammealis.—Scarce around Chesh.
Cataclysta
lemnalis.—Common, Chesh. Marsh.
Paraponyx
stratiotalis.—Common, Ches. Marsh.
Hydrocampa
nymphæalis. — Common, Cheshunt Marsh.
stagnalis.—Common, Chesh. Marsh.
Acentropus
niveus.—Common, Cheshunt Marsh.
Botys
verticalis.—Common around Chesh.
urticalis.—Common around Chesh.
Ebulea
crocealis.—Common, Chesh. Marsh.
catalaunalis. — Once at Cheshunt, 18th Sept., 1867 (still unique).
sambucalis.—Common around Ches.
Pionea
forficalis.—Common around Chesh.
Spilodes
cinctalis.—Common around Chesh.

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Scopula
olivalis.—Common around Cheshunt.
prunalis.—Common around Chesh.
ferrugalis.—Scarce around Cheshunt.
Stenopteryx
hybridalis.—Common around Chesh.
Scoparia
ambigualis.—Common around Chesh.
cembræ.—Scarce around Cheshunt.
dubitalis.—Common around Chesh.
mercurella.—Common around Chesh.
cratægella.—Common around Chesh.
resinea.—Bayford.

CRAMBITES.

Crambus
falsellus.—Used to occur at Chesh.
pratellus.—Common around Chesh.
pascuellus.—Common around Chesh.
pinetellus.—Once, Waltham Cross and Goff's Oak.
perlellus.—Scarce around Cheshunt.
warringtonellus. — Scarce around Cheshunt.
selasellus.—Common around Chesh.
tristellus.—Common around Chesh.
inquinatellus. — Common, Broxbourne Woods.
geniculeus.—Common around Chesh.
culmellus.—Common around Chesh.
hortuellus.—Common around Chesh.
Chilo
phragmitellus. — Scarce, Cheshunt Marsh.
Schœnobius
forficellus. — Common, Cheshunt Reservoir and Marsh.
Homœosoma
sinuella.—Scarce, Waltham Cross.
Ephestia
elutella.—Common around Cheshunt
ficella.—Common in shops, Chesh.
pinguis.—Scarce, Cheshunt.
Phycis
roborella.—Scarce, Theobalds Park.
Rhodophæa
formosella.—Scarce, Waltham Cross.
advenella.—Scarce, Cheshunt Street.
suavella.—Scarce, Cheshunt Marsh.
Oncocera
ahenella.—Scarce, Cheshunt.
Melia
sociella.—Common, Cheshunt.
Meliphora
alveariella.—Scarce, Waltham Cross.

TORTRICES.

Halias
prasinana.—Scarce around Cheshunt.
quercana.—Scarce around Cheshunt.
chlorana.—Scarce, Cheshunt Marsh.
Tortrix
pyrastrana.—Common around Chesh.
xylosteana.—Common.
sorbiana.—Common.
rosana.—Common.
transitana.—Two specimens, Church Gate, Cheshunt.
heparana.—Common around Chesh.
ribeana.—Common around Cheshunt
unifasciana.—Common around Ches.
costana.—Scarce, Cheshunt Marsh.
icterana.—Near Cheshunt Station.
viridana.—Common around Chesh.
ministrana.—Broxbourne Woods.
adjunctana.—Common around Ches.
Dichelia
grotiana.—Common around Chesh.
Leptogramma
literana.—Scarce, Broxb. Woods.
Peronea
favillaceana.—Common around Ches.
schalleriana.—Scarce around Chesh
variegana.—Common around Chesh.
hastiana.—Scarce around Cheshunt.
aspersana.—Scarce, Waltham Cross.
Teras
caudana.—Scarce around Cheshunt.
contaminana. — Common around Cheshunt.
Dictyopteryx
lœflingiana.—Common around Ches.
holmiana.—Common around Chesh.
bergmanniana. — Common around Cheshunt.
forskaleana.—Goff's Oak.
Argyrotoxa
conwayana.—Scarce around Chesh.
Ptycholoma
lecheana.—Scarce around Cheshunt.
Ditula
hartmanniana.—Common, Cheshunt Marsh.
semifasciana.—Scarce, Chesh. Marsh.
Penthina
betulætana. One specimen, Broxbourne Woods, 1901.
pruniana.—Common around Chesh.
ochroleucana. — Common around Cheshunt.
cynosbana.—Common around Chesh.
gentianana.—Common around Ches.
Antithesia
salicana.—Common, Chesh. Marsh.
Spilonota
ocellana.—Common around Chesh.
aceriana.—Common, Chesh. Marsh.
dealbana.—Common around Chesh.
neglectana.—Common around Chesh.
suffusana.—Common around Chesh.
rosæcolana.—Common around Chesh.
roborana.—Common around Chesh.

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Pardia
tripunctana.—Common around Ches.
Aspis
udmanniana.—Common around Ches.
Siderea
achatana.—Common around Chesh.
Sericoris
lacunana.—Common around Chesh.
urticana.—Scarce around Cheshunt.
Euchromia
purpurana.—Scarce around Chesh.
Orthotænia
striana.—Common around Cheshunt.
Phtheochroa
rugosana.—Scarce around Cheshunt.
Cnephasia
musculana.—Scarce around Chesh.
Sciaphila
nubilana.—Common around Chesh.
pascuana.—Scarce, Chesh. Marsh.
subjectana.—Common around Ches.
virgaureana.—Common around Ches
alternana.—Scarce around Cheshunt.
hybridana.—Locally common around Cheshunt.
Sphaleroptera
ictericana.—Common around Chesh.
Bactra
lanceolana.—Common around Chesh.
Phoxopteryx
lundana.—Scarce around Cheshunt.
Grapolitha
nisana.—Scarce, Broxbourne Woods.
nigromaculana.—Scarce, Broxbourne Woods.
campoliliana.—Scarce around Chesh.
trimaculana.—Common around Ches.
nævana.—Common around Cheshunt
Hypermecia
cruciana.—Common, Chesh. Marsh.
Batodes
angustiorana.—Comm. around Ches.
Pædisca
bilunana.—Common around Chesh.
oppressana.—Locally common, Ches. Marsh.
corticana.—Common around Chesh.
sordidana.—Locally common, Chesh. Marsh.
Ephippiphora
ephippana.—Scarce, Chesh. Marsh.
Semasia
spiniana.—Scarce, Cheshunt Marsh.
janthinana.—Common around Ches.
wœberana.—Common around Chesh.
Coccyx
ochsenheimeri.—Once, Walt. Cross.
splendidulana.—Once, Theobalds Pk.
argyrana.—Common around Chesh.
hyrciniana.—Wormley.
nanana.—Scarce, Church Gate, Ches.
Retinia
buoliana.—Common around Chesh.
Carpocapsa
splendana.—Scarce around Chesh.
pomonana.—Common around Chesh.
Opadia
funebrana.—Sometimes common around Cheshunt.
Endopisa
pisana.—Common around Cheshunt.
Stigmonota
internana.—Broxbourne Woods.
composana.—Scarce around Chesh.
regiana.—Scarce, Theobalds Park.
Dichrorhampha
politana.—Common around Chesh.
sequana.—Common around Chesh.
petiverella.—Common around Chesh.
plumbagana.—Comm. around Chesh.
acuminatana.—Cheshunt Reservoirs.
Pyrodes
rheediella.—Common around Chesh.
Catoptria
ulicetana.—Common around Chesh.
hypericana.—Common around Ches.
scopoliana.—Scarce around Chesh.
hohenwarthiana.—Common around Cheshunt.
expallidana.—Scarce around Chesh.
Choreutes
scintillulana.—Common, Cheshunt Marsh.
Xylopoda
fabriciana.—Common around Chesh.
pariana.—Scarce around Cheshunt.
Eupœcilia
dubitana.—Scarce, Waltham Cross.
Xanthosetia
zoeganana.—Common around Chesh.
hamana.—Common around Chesh.
Chrosis
tessarana.—Scarce, Cadmore Lane, Cheshunt.
Cochylis
smeathmanni.—Comm. around Ches.
stramineana.—Common around Ches.
Tortricodes
hyemana.—Common, Broxbourne and Wormley Woods.

TINEÆ.

Lemnatophila
phryganella.—Bayford.
Exapate
gelatella.—Scarce around Cheshunt.
Diurnea
fagella.—Common around Cheshunt.
Epigraphia
steinkellneri.—Scarce, Cheshunt St.

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Talæporia
pseudo-bombycella.—Comm. around Cheshunt.
Fumea
pullella.—Scarce, Cheshunt Marsh.
roboricolella. — Common around Cheshunt.
Diplodoma
marginepunctella.—Scarce around Cheshunt.
Xysmatodoma
melanella.—Scarce around Chesh.
argentimaculella. — Scarce around Cheshunt.
Ochsenheimeria
birdella.—Common around Cheshunt
Scardia
parasitella. — College Road and Bury Green, Cheshunt.
cloacella.—Common around Chesh.
ruricolella.—Common.
arcella.—Scarce around Cheshunt.
Tinea
ferruginella. — Common, Waltham Cross.
rusticella.—Common around Chesh.
tapetzella.—Common around Chesh.
pellionella.—Common around Chesh.
pallescentella.—Scarce around Ches.
lappella.—Common around Chesh.
biselliella.—Common around Chesh.
semifulvella.—Scarce, Brox. Woods.
Lampronia
quadripunctella. — Scarce, Dark Lane, Cheshunt.
rubiella.—Common around Chesh.
Incurvaria
muscalella.—Common around Chesh.
capitella.—Common around Chesh.
Micropteryx
seppella.—Common around Chesh.
mansuetella.—Scarce, Bury Green, Cheshunt.
thunbergella.—Common, Broxb. and Wormley Woods.
subpurpurella. — Common around Cheshunt.
Nemophora
swammerdam. — Common around Cheshunt.
schwarziella. — Common around Cheshunt.
Adela
fibulella.—Scarce around Cheshunt.
rufimitrella.—Common around Ches.
viridella.—Common around Chesh.
Swammerdam
apicella.—Scarce around Cheshunt.
oxyacanthella. — Common around Cheshunt.
Swammerdam
lutarella.—Common around Chesh.
pyrella.—Common around Cheshunt
Scythropia
cratægella.—Scarce around Chesh.
Hyponomeuta
vigintipunctata.—Cheshunt Street.
plumbellus.—Bayford.
padellus.—Common.
euonymellus.—Scarce, Cheshunt and Bayford.
Prays
curtisellus.—Common around Chesh.
rusticus.—Common around Chesh.
Plutella
cruciferarum. — Common around Cheshunt.
porrectella.—Bayford.
Cerostoma
radiatella.—Common around Chesh.
costella.—Scarce around Cheshunt.
sylvella.—Scarce around Cheshunt.
Harpipteryx
xylostella.—Common around Chesh.
Orthotelia
sparganella.—Local, Chesh. Marsh.
Enicostoma
lobella.—Scarce, Flamstead End.
Phibalocera
quercana.—Common around Chesh.
Depressaria
costosa.—Common around Cheshunt
liturella.—Common around Cheshunt
scopariella. — Common, Cheshunt and Carnell's Green.
arenella.—Common.
subpropinquella.—Common around Cheshunt.
rhodochrella.—Scarce around Chesh.
alstrœmeriella.—Scarce around Ches.
purpurea.—Common around Chesh.
capreolella.—Church Gate, Cheshunt
conterminella. — Scarce, Cheshunt Marsh.
ocellella.—Common, Chesh. Marsh.
applanella.—Common around Chesh.
pulcherrimella.—Cheshunt Street.
chærophyllella. — Scarce around Cheshunt.
ultimella.—Scarce around Cheshunt.
heracleana.—Common around Ches.
Gelechia
rufescens.—Common around Chesh.
malvella.—Scarce around Cheshunt.
populella.—Common around Chesh.
pinguinella. — Common, Cheshunt Marsh.
ericetella.—Common, Brox. Woods.
mulinella.—Common, Brox. Woods.
terrella.—Common around Cheshunt

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Gelechia
politella.—Two specimens, Turnford Lock.
arundinetella.—Cheshunt Marsh.
senectella.—Scarce around Cheshunt
affinis.—Burton Grange, Cheshunt.
domestica.—Common around Chesh.
rhombella.—Common around Chesh.
notatella.—Scarce, Brookfield Lane, Cheshunt.
vulgella.—Common around Chesh.
luculella.—Scarce, Theobalds Park.
fugitivella.—Common around Chesh.
maculea.—Dark Lane, Cheshunt.
tricolorella.—Common around Ches.
fraternella.—Scarce, Chesh. Marsh.
obsoletella. — Common, Waltham Cross.
leucatella.—Common around Chesh.
albicapitella.—Scarce around Chesh
nanella.—Common around Chesh.
mouffetella.—Scarce around Chesh.
tenebrella.—Common around Chesh.
tenebrosella.—Common around Ches.
ligulella.—Scarce around Cheshunt.
vorticella. — Beaumont Green, near Wormley.
tæniolella.—Scarce, Bayford.
bifractella.—Common, Broxbourne Woods.
lutulentella.—One, Cheshunt Marsh, 1876. (Stainton named this.)
næviferella.—Common, Walt. Cross.
hermannella.— Common, Waltham Cross.
ericinella.—Pollards, Wormley.
paupella.—Common around Chesh.
inopella —Common around Cheshunt

Cleodora
cytisella.—Pollards, Wormley.

Hypsilophus
marginellus.—Scarce, Cheshunt St.

Harpella
geoffrella.— Common, Dark Lane, Cheshunt.

Dasycera
sulphurella.—Common around Ches.
olivierella.—Scarce around Chesh.

Œcophora
minutella.—Common around Chesh.
angustella.—Scarce, Cheshunt St.
lunaris.— Common around Cheshunt.
tinctella.—Scarce, Cheshunt Street.
unitella.—Common, Cheshunt Street.
flavifrontella.—Scarce, Dark Lane, Cheshunt.
fuscescens.—Common around Chesh.
pseudospretella. — Common around Cheshunt.

Œcogenia
Kindermaniella.—Scarce, Crossbrook Street, Waltham Cross.

Endrosis
fenestrella.—Common around Chesh.

Butalis
chenopodiella.—Common, Waltham Cross.

Acrolepia
pygmæella.—Common around Chesh.

Glyphipteryx
fuscoviridella.—Comm. around Ches.
thrasonella.—Common around Ches.
cladiella.—Scarce, Cheshunt Marsh.
equitella.— Common around Chesh.
fischeriella.—Scarce around Chesh.

Perittia
obscurepunctella.—Near St. James's Church, Goff's Oak.

Tinagma
sericiellum.—Common around Ches.
resplendellum.—Scarce around Ches.

Argyresthia
ephippella.—Common, Cheshunt St.
nitidella.—Common around Chesh.
semitestacella. — Common, Broxbourne Woods.
albistria.—Common around Chesh.
conjugella.—Common around Chesh.
semifusca.—Common around Chesh.
mendica.—Burton Grange, Cheshunt.
glaucinella.—Burton Grange, Ches.
retinella.—Waltham Cross.
andereggiella.—Scarce, Cheshunt St.
curvella.—Common around Chesh.
pygmæella.—Scarce, Chesh. Marsh.
gœdartella —Common around Chesh.
brockeella.—Common around Chesh.

Cedestis
farinatella. — Once, Church Gate, Cheshunt.

Gracilaria
swederella.—Common around Chesh.
stigmatella.—Common around Ches.
tringipennella.— Cheshunt Marsh and Theobalds.
syringella.—Common around Chesh.
auroguttella.—Flamstead End, Ches.

Coriscium
brongniardella. — Common around Cheshunt.

Ornix
avellanella.—Common around Chesh.
anglicella.— Common around Chesh.
torquilella.—Common around Chesh.
scoticella —Cheshunt Street.
guttea.—Common around Cheshunt.

Coleophora
fabriciella.—Scarce around Chesh.
alcyonipennella.—? Cheshunt Marsh.
paripennella.—Comm. around Ches.

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Coleophora
albicosta.—Church Gate, Cheshunt.
anatipenella.—Comm. around Ches.
genistæ.—Pollards, Wormley.
lineolella.—Local, Cheshunt St. and Waltham Cross.
cæspititiella.—Comm. around Chesh.
apicella.—Scarce around Cheshunt.
argentula.—Common around Chesh.
juncicolella.—Pollards, Wormley.
laricella.—Common around Chesh.
albitarsella.—Common, west side of Cheshunt Street.
nigricella.—Common around Chesh.
fuscedinella.—Common around Ches.
gryphipennella.—Common around Cheshunt.
siccifolia.—Sometimes comm. around Cheshunt.
viminetella.—Common, Ches. Marsh.
solitariella.—Common around Ches.
badiipennella.—Cheshunt Street.

Bedellia
somnolentella.—Scarce, Church Gate, Cheshunt.

Batrachedra
præangusta.—Common around Ches.

Chauliodus
chærophyllellus. — Common around Cheshunt.

Laverna
epilobiella.—Common around Chesh.
ochraceella.—Scarce around Chesh.
phragmitella.—Scarce, Church Gate.
decorella.—Scarce around Cheshunt.
subbistrigella.—Scarce around Ches.
hellerella.—Common around Chesh.

Chrysoclysta
linneella.—Scarce, Waltham Cross.
flavicapitella. — Common, Cadmore Lane, Cheshunt.

Anybia
langiella.—College Road, Cheshunt.

Cataplectica
flavimaculella.—Common, Cheshunt Marsh.

Asychna
modestella.—Common around Chesh.

Antispila
pfeifferella.—Common around Ches.

Elachista
magnificella.—Once in Ches. Marsh.
albifrontella.—Scarce around Chesh.
poæ.—Common, Cheshunt Marsh.
nigrella.—Common around Chesh.
subnigrella.—Common around Ches.
megerlella.—Common around Chesh.
cerussella.—Common, Chesh. Marsh.
rufocinerea.—Common around Ches.

Elachista
cygnipennella. — Common around Cheshunt.

Tischeria
complanella. — Common around Cheshunt.
marginea.—Common around Chesh.

Lithocolletis
hortella.—Theobalds Park.
pomifoliella. — Now divided into several species of which some occur in Cheshunt.
corylella.—Common around Chesh.
spinicolella.—Common around Ches.
cerasicolella.—Waltham Cross.
faginella.—Common around Chesh.
viminetella. — Common, Cheshunt Marsh.
carpinicolella.—Scarce around Ches.
ulmifoliella.—Scarce around Chesh.
spinolella.—Scarce around Cheshunt
quercifoliella. — Common around Cheshunt.
messaniella.—Common around Ches.
corylifoliella. — Common around Cheshunt.
alnifoliella.—Common around Ches.
cramerella.—Common around Ches.
tenella.—Common around Chesh.
acerifoliella.—Common around Ches.
emberizæpenna. — Common around Cheshunt.
schreberella. — Common around Cheshunt.
tristrigella.—Comm. around Chesh.
trifasciella.—Common around Chesh.
comparella.—Scarce around Chesh.

Lyonetia
clerckella.—Common, Cheshunt and Bayford.

Phyllocnistis
suffusella.—Common, Chesh. Marsh.
saligna.—Common, Chesh. Marsh.

Cemiostoma
laburnella.—Common around Chesh.
scitella.—Common around Cheshunt

Opostega
salaciella.—Scarce around Cheshunt.
crepusculella.—Scarce around Chesh.

Bucculatrix
aurimaculella. — Common around Cheshunt.
ulmella.—Scarce around Cheshunt.
cratægi.—Common around Chesh.
boyerella.—Common around Chesh.

Nepticula
atricapitella.—Common around Ches.
ruficapitella.—Common around Ches.
basiguttella.—One mine of a larva, Cheshunt Street.

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Nepticula
anomalella.—Common around Ches.
minusculella.—Cheshunt Street.
septembrella.—Common, Flamstead End.
subbimaculella. — Common around Cheshunt.
trimaculella.—Scarce around Chesh.
floslactella.—Common around Ches.
salicis.—Common around Cheshunt.
plagicolella.—Common around Ches.
tityrella.—Common around Chesh.
angulifasciella.—Wormley.
atricollis.—Cadmore Lane, Cheshunt Street.
gratiosella.—Common around Ches.
marginicolella. — Common around Cheshunt.
hodgkinsoni.—Cheshunt Street.
aurella.—Common around Cheshunt.

PTEROPHORI.

Pterophorus
rhododactylus.—One at light, Cheshunt Marsh.
ochrodactylus. — Two, Waltham Cross.
trigonodactylus. — Common around Cheshunt.
acanthodactylus.—Common around Cheshunt.
bipunctidactylus. — Scarce around Cheshunt.
fuscodactylus. — Common around Cheshunt.
pterodactylus. — Common around Cheshunt.
pentadactylus. — Common around Cheshunt.

Alucita
polydactyla.—Common around Ches.

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XI.

LIST OF WORKS ON THE GEOLOGY OF HERTFORDSHIRE, 1884–1900.

By John Hopkinson, F.L.S., F.G.S., Assoc. Inst. C.E., etc.

Read at Watford, 23rd April, 1901.

Owing entirely to the initiative and chiefly to the labours of our past President, Mr. W. Whitaker, F.R.S., most of the counties of England have their Geological Bibliography, and amongst the valuable series of Bibliographies compiled by him is a "List of Works on the Geology of Hertfordshire" from 1756 to 1873, which he contributed to our Society in 1875.* In 1885 I gave a further list of works published during the ten years 1874 to 1883, with some additions to the former list (1598–1873).† The subject was again taken up by Mr. Whitaker in his Presidential Address to the Society in the year 1899, but instead of a formal list of works commencing with the year 1884, we have in this Address notices of the geological and other work done for the county outside our own Society from 1890 to the commencement of 1899.‡ There is thus a hiatus of six years (1884–89), which in this Address Mr. Whitaker suggested should be filled up by me, but I consider it better to continue the list in the same form as before, including in it the publications of our Society, and completing it so far as I am able to do so to the end of the century.

For five of the six years left untouched by Mr. Whitaker so far as Hertfordshire geology is concerned, there is no geological bibliography for Britain except the annual "List of Additions to the Library" of the Geological Society, the 'Geological Record' having ceased with the year 1884, and the 'Annals of British Geology,' now also defunct, having commenced with the year 1890. It is therefore probable that some books or papers containing information on the geology of Hertfordshire, published during this period, may have escaped my notice.

In addition to the works here enumerated a few papers have been published which, although not actually treating of Hertfordshire, are of interest to the students of its geology. Of these two on the Chalk and two on the Eocenes may be mentioned. In 1884 a paper by the late Professor Morris on "The Chalk: its Distribution and Subdivisions" appeared in the 'Geological Magazine,' which should be read by all Hertfordshire geologists, although the county is never mentioned in it; and in 1894 Dr. W. F. Hume contributed to the Geologists' Association a paper "On the Genesis of the Chalk" of much interest to us, although the only reference to Hertfordshire geology is the remark that "The Greensand dies

* 'Trans. Watford Nat. Hist. Soc.,' Vol. I, pp. 78–82.
† 'Trans. Herts Nat. Hist. Soc.,' Vol. III, pp. 165–172.
‡ Ibid., Vol. X, pp. 105–118.

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away altogether at Tring, in Hertford." Mr. Hume appears to be unaware that Hertford is our county town. A similar mistake is made in referring to our Society as the "Hertford Natural History Society." In "A Revision of the Lower Eocenes" Mr. G. F. Harris only once mentions our county, and in his "Notes on the London Clay and its Deposition" Mr. J. S. Gardner does not allude to Hertfordshire at all. Both these papers appeared in the 'Proceedings of the Geologists' Association' for 1887, and are of interest to Hertfordshire geologists.

During the last few years much attention has been devoted to the superficial deposits, and several papers have been published by the Geological Society and the Geologists' Association which give the results of investigations on these very variable beds within the area of which our county forms a part. The Geological Survey Drift maps of the whole of Hertfordshire have been published except one sheet, 46 S.W., in which is the north-west corner of the county. The survey of the superficial deposits of this area is completed, but it may be a considerable time before the map appears. The London agent for the sale of the maps of the Survey, Mr. E. Stanford, received the first two copies of the Drift Map 46 S.E., ostensibly published in December, 1898, about the middle of December, 1899.

Many of the entries refer to works or papers which treat of the water-supply of London, a supply to which our county contributes an undue quota. One result of looking up the literature of this subject is that more than half the additions to the two former lists are of such works. The comparatively large number of recent references to it is chiefly due to the publication in 1893 of the Report of the Royal Commission on the Water Supply of the Metropolis, with its Appendices, etc., and to the interest in the subject to which this and the many Water Bills which have recently been brought before Parliament gave rise. This subject has so frequently and so recently (see Nos. 295 and 298) been brought before our Society, that I will only allude to three papers which show what erroneous and contradictory views are held as to the flow of water in the Chalk.

In 'A Paper on Bournes' (No. 142) Mr. H. H. French says that the bournes north of the Thames rise in the same years as those south of that river, adding: "It is a most important point, too, that they rise *only* in those years, which shows that the vast underground sheet of water is continuous on both sides of the Thames, and even beyond." Did they so rise it would only show that like causes give like results, each year's or winter's rainfall being much the same in the two areas, but it would be a natural inference, were the continuity of the reservoir in the Chalk thus proved, that our Hertfordshire rivers might be depleted by an excessive amount of water being pumped from wells in Surrey, or "even beyond," simultaneously with such pumping. They do not, however, for our Bourne has flowed several times when the Croydon Bourne has not, if Mr. French's dates are correct.

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As an example of the opposite extreme, a paper by Mr. J. L. Lobley (No. 228) may be referred to. He holds the view that our rivers derive their supply of water from a very small area in their immediate vicinity, so that however vast a quantity of water is abstracted from the Chalk throughout the area over which they flow, their volume cannot be sensibly affected. As we have large tracts of country without rivers, he thinks that the Chalk may be entirely deprived of the available water which it contains under such tracts without appreciably affecting the rivers on either side of them, overlooking or ignoring the fact that it is owing to the depletion of our Chalk reservoir from natural causes, now augmented by artificial ones, that such tracts, over many of which rivers formerly flowed in valleys now dry, are waterless.

In discussing the future water-supply of London, the late Sir Edward Frankland (No. 267) expressed a view which differs from either of the above. He evidently thought that the level of the water in the Chalk in the catchment-basin of the Thames nowhere rises to the surface, for he said: "The rivulets and streams of the Thames basin are formed and pursue their course on clay land. There are no streams on the Chalk." We have not yet arrived at this dessicated condition, several of our rivers being augmented either in their beds or on their margins by springs which rise directly from the Chalk. A little further depression of the water-level in the Chalk than would cause them to cease to flow would convert their channels into swallow-holes, as is now the case under usual conditions in the upper valley of the Colne.

In the first paper a correct theory is merely carried too far; in the second, conclusions are arrived at which are unwarranted by either theory or facts. The statement in the third paper may become true if our Chalk reservoir is much further depleted.

One work in the list merits special mention on account of its great value. Mr. Whitaker's 'Geology of London and of Part of the Thames Valley' (No. 195), a Memoir of the Geological Survey published in 1889, is indispensable to students of Hertfordshire geology, as may be gathered from the references which I have given under its heading.

I must also mention a very valuable piece of experimental work carried out in our county in 1879, but of which the methods and results were not published until 1895. I refer to the elaborate and carefully-conducted experiments made by Mr. Joseph Francis to determine the direction and angle of dip of the Palæozoic rocks in the borings of the New River Company at Turnford and Ware. The experiments were made under the direction of a Committee consisting of Sir William Thomson (now Lord Kelvin), Dr. C. W. Siemens, Professor (now Sir George) Stokes, Professor T. McKenny Hughes, Professor J. C. Maxwell, Mr. Robert Etheridge, Mr. R. W. Mylne, and Mr. James Muir.* The results were that the Wenlock

* Mr. Whitaker, to whom I am indebted for a few entries in this List, desires me to state that in his Anniversary Address to the Society in 1899 (No. 300) he inadvertently omitted to notice these experiments.

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rocks at Ware, 828 feet below the surface of the ground, were found to dip at an angle of 41° about one degree west of true south, and that the Devonian rocks at Turnford near Cheshunt, 994 feet below the surface, were found to dip at an angle of 25° about 17 degrees west of true south. If this is a true indication of the general dip of the Palæozoic rocks in this area, we need not fear that our beautiful county will ever be turned into a coal-mining district, for the Coal Measures, if present at all under the London Basin, should lie considerably to the south of Hertfordshire. In 1879, in treating of the Ware boring in relation to water-bearing strata, I expressed the opinion that "it would be useless to search for coal (in the London Basin) north of London."* The direction of dip of the Wenlock rocks in this boring had not then been determined, nor had the presence of Devonian rocks at Turnford been made known. Professor Sollas has recently (No. 309) advocated the making of a trial-boring for coal "somewhat west of Enfield Lock," but the arguments which he adduces in support of his views do not seem to me to warrant such an experiment.

References to accounts of earthquakes are not included in this list, except in one instance (No. 157) where there is information on the strata which transmitted the shock. Some material has been collected towards a catalogue of Hertfordshire earthquakes, in which such references would more appropriately be given.

1884.

137. Bonney, Prof. T. G. On the Microscopic Structure of a Boulder from the Cambridge Greensand, found at Ashwell, Herts. *Proc. Cambridge Philos. Soc.*, vol. v, pt. 1, pp. 65–67.

138. Elsden, J. V. On the Microscopic Structure of Boulders found in the North of Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. iii, pt. 2, pp. 47–57, pls. iii–v.

139. Fordham, H. G. Notes on Boulders and Boulder Clay in North Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. iii, pt. 1, pp. 33–46, pls. i, ii.

140. Fordham, H. G. Thirteenth Report of the . . . . Erratic Blocks Committee. By Dr. H. W. Crosskey. *Rep. Brit. Assoc.* for 1883, pp. 136–146. (Herts, by H. G. F., pp. 143–146.)

141. Fordham, H. G. On a Boulder from the Chloritic Marl of Ashwell, Herts. *Ib.*, Trans. Sections, pp. 505–506.

142. French, H. H. A Paper on Bournes. 8vo. Sutton, Surrey. (Geological Map and Section of the London Basin, including Herts.)

143. [Hopkinson, J.] Field Meeting . . . . Berkhamsted and the Valley of the Bourne. *Trans. Herts Nat. Hist. Soc.*, vol. ii, pt. 8, pp. lv–lx. (Remarks by Dr. J. Evans, pp. lvii–lix.)

144. Hopkinson, J. Excursion to Radlett. *Proc. Geol. Assoc.*, vol. viii, no. 8, pp. 452–458. Field Meeting . . . . Radlett and Battler's Green. *Trans. Herts Nat. Hist. Soc.*, vol. iii, pt. 4 (1885), pp. xli–xlvi.

* 'Trans. Watford Nat. Hist. Soc.,' Vol. II, p. 246.

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145. Judd, Prof. J. W. On the Nature and Relations of the Jurassic Deposits which underlie London *Quart. Journ. Geol. Soc.*, vol. xl, pt. 4, pp. 724–764. (Herts, pp. 752–754; sections at Turnford and Ware, facing p. 760.)

146. Lucas, J. Water from the Chalk. *Internat. Health Exbtn.* Water Supply and Distribution. 8vo. London. (Herts, pp. 26–27.)

147. Taylor, J. E. New Evidences of Primæval Man [at Hitchin]. *Science Gossip*, p. 50.

148. Whitaker, W. Guide to the Geology of London and the Neighbourhood. *Geol. Surv. Memoir.* 4th ed. 8vo. London. (Includes Barnet, Rickmansworth, and Watford.)

149. Whitaker, W. On the Area of Chalk as a Source of Water Supply. *Internat. Health Exbtn.* Water Supply and Distribution. 8vo. London. (Herts, p. 12.) Also in *Journ. Soc. Arts.*

150. Whitaker, W. [and others]. Sheet 47 of the Map of the *Geological Survey.* Scale 1 inch to a mile. Drift edition. (Royston, Bishop's Stortford, Ware, Hertford, etc.)

151. Whitaker, W. [and others]. Sheet 46 N.E. of the Map of the *Geological Survey.* Scale 1 inch to a mile. Drift edition. (Ashwell, Baldock, Hitchin.) Revised edition issued in 1891.

1885.

152. Brodie, Rev. P. B. An Account of the different Borings in England in search of the Carboniferous Rocks. *Proc. Warwick. Nat. Hist. Field Club*, pp. 34–39 (Ware and Turnford).

153. Etheridge, R. Manual of Geology . . . . by John Phillips. Part II. Stratigraphical Geology and Palæontology. By R. E. 8vo. London. (Herts, pp. 168, 548, 605, 607.)

154. Evans, Dr. J. Physiography. (Pp. 1–22 of) The Theory and Practice of Hydro-Dynamics. *Inst. Civ. Eng.* 8vo. London. (Geology of Herts, pp. 12–15.)

155. Hopkinson, J. List of Works on the Geology of Hertfordshire, 1874–83. *Trans. Herts Nat. Hist. Soc.*, vol. iii, pt. 5, pp. 165–172.

156. Hopkinson, J. Excursion to Hertford and Ware. *Proc. Geol. Assoc.*, vol. ix, no. 4, pp. 182–186. Field Meeting . . . . Hertford and Ware. *Trans. Herts Nat. Hist. Soc.*, vol. iii, pt. 8 (1886), pp. lxv–lxx.

157. Meldola, Prof. R., and W. White. Report on the East Anglian Earthquake, April 22nd, 1884. *Essex Field Club Special Memoirs*, vol. i. 8vo. London. (Geology of Herts, p. 179.)

158. Whitaker, W. Some Hertfordshire Well-Sections. *Trans. Herts Nat. Hist. Soc.*, vol. iii, pt. 5, pp. 173–180.

1886.

159. Andrews, R. T. Thirteenth Report of the . . . . Erratic Blocks Committee. By Dr. H. W. Crosskey. *Rep. Brit. Assoc.* for 1885. (Herts, by R. T. A., pp. 323–325.)

160. Hill, W. On the Beds between the Upper and Lower Chalk of Dover, and their comparison with the Middle Chalk

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of Cambridgeshire. *Quart. Journ. Geol. Soc.*, vol. xlii, pt. 2, pp. 232–247. (Herts, pp. 237, 242–243, 245.)

161. HILL, W., and A. J. JUKES-BROWNE. The Melbourne Rock and the Zone of *Belemnitella plena* from Cambridge to the Chiltern Hills. *Quart. Journ. Geol. Soc.*, vol. xlii, pt. 2, pp. 216–231. (Herts, pp. 222–223, 225–231.)

162. HOPKINSON, J. Excursion to Welwyn. *Proc. Geol. Assoc.*, vol. ix, no. 8, pp. 434–437. Field Meeting . . . . Welwyn. *Trans. Herts Nat. Hist. Soc.*, vol. iv, pt. 8 (1888), pp. xxii–xxiii.

163. PRESTWICH, Prof. J. Geology: Chemical, Physical, and Stratigraphical. 2 vols. 8vo. Oxford. Vol. I, Chemical and Physical. (Herts springs, pp. 159, 161, 165, 166, and plate opposite.) Vol. II, Stratigraphical and Physical. (Herts pudding-stone, p. 342.)

164. WHITAKER, W. On some Borings in Kent. *Quart. Journ. Geol. Soc.*, vol. xlii, pt. 1, pp. 26–48. Deep-seated Geology of the London Basin, p. 40 (Cheshunt and Ware, pp. 41, 43, 45, 46).

1887.

165. BRETT, Dr. A. T. Section at the Sewage Farm, Watford Fields. *Trans. Herts Nat. Hist. Soc.*, vol. iv, pt. 4, p. 117.

166. EVANS, Dr. J. Discussion on papers by W. Fox and J. W. Grover (Nos. 167 and 168). *Proc. Inst. Civ. Eng.*, vol. xc, pp. 48–52 (Colne Valley).

167. FOX, W. Borings in the Chalk at Bushey, Herts. *Proc. Inst. Civ. Eng.*, vol. xc, pp. 21–27. Discussion, pp. 83–84.

168. GROVER, J. W. Chalk-Water Springs in the London Basin, illustrated by the . . . . Rickmansworth Waterworks. *Proc. Inst. Civ. Eng.*, vol. xc, pp. 1–20. (The Rickmansworth Waterworks, pp. 17–20; Discussion, pp. 81–83.)

169. HAYWARD, R. B. H. On the Water in the Chalk beneath the London Clay in the London Basin. *Trans. Middlesex Nat. Hist. Soc.*, 1886–87, pp. 48–63. (Herts, pp. 53–59.)

170. HOPKINSON, J. Introduction to Pryor's 'Flora of Hertfordshire.' *Herts Nat. Hist. Soc.* 8vo. London and Hertford. (Stratigraphical Geology, pp. ix–xvii; Hydro-geology, pp. xviii–xxi.)

171. LATHAM, B. Discussion on papers by W. Fox and J. W. Grover (Nos. 167 and 168). *Proc. Inst. Civ. Eng.*, vol. xc, p. 59 (Colne Valley, pp. 61–64).

172. [Phillips, A. F.] Section at the St. Albans New Waterworks. *Trans. Herts Nat. Hist. Soc.*, vol. iv, pt. 4, p. 117.

173. SMITH, W. G. Primæval Man in the Valley of the Lea. *Essex Naturalist*, vol. i, pp. 36–38 (Herts); 83–91; 125–137 (Herts, pp. 131–133).

174. VERINI, W. Section at the Well and Boring made at the Colne Valley Waterworks, Watford. *Trans. Herts Nat. Hist. Soc.*, vol. iv, pt. 4, pp. 116–117.

175. WARINGTON, Prof. R. A Contribution to the Study of Well Waters. *Journ. Chem. Soc.*, vol. li, pp. 500–552. (The Well Waters of Harpenden, pp. 520–552.)

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176. Whitaker, W. Discussion on papers by W. Fox and J. W. Grover (Nos. 167 and 168). *Proc. Inst. Civ. Eng.*, vol. xc, p. 52 (Bushey, pp. 56–57).

177. Woodward, H. B. The Geology of England and Wales. 2nd ed. 8vo. London. (Herts, pp. 412, 431, and Appendix i.)

1888.

178. Bolton, Colonel Sir F. London Water Supply. New ed. by P. A. Scratchley. 8vo. London. (The New River, pp. 62–72.)

179. Bonney, Prof. T. G. Note on the Structure of the Ightham Stone. *Geol. Mag.*, dec. iii, vol. v, no. 7, pp. 297–300. (Herts puddingstone, p. 300.)

180. Bookey, R. H. Geological Jottings. *Herts Constitutional Mag.*, vol. i, pp. 300–303 (Herts).

181. Cameron, A. C. G. Hertfordshire Subsidences [in the Chalk]. *Geol. Mag.*, dec. iii, vol. v, no. 1, pp. 24–26.

182. Fordham, H. G. A Record of Water-level in a deep Chalk Well at Barley, Herts, 1864–1886. *Trans. Herts Nat. Hist. Soc.*, vol. v, pt. 4, pp. 20–22, pl. i.

183. Harris, G. F. The Water Supply of the Metropolis. *Proc. Soc. Amateur Geologists*, vol. i, no. 3, pp. 21–23. (Analysis of Lea water, p. 22; sections, Cheshunt and Ware, p. 23.)

184. Holmes, T. V. The Subterranean Geology of South-eastern England. *Essex Naturalist*, vol. ii, pp. 138–158. (Herts, pp. 148–156.)

185. [Hopkinson, J.] Field Meeting . . . . Hitchin. *Trans. Herts Nat. Hist. Soc.*, vol. iv, pt. 8, pp. xxx–xxxii.

186. Hopkinson, J. Excursion to Rickmansworth. *Proc. Geol. Assoc.*, vol. x, no. 9, pp. 499–501. Field Meeting . . . . Rickmansworth and Chorleywood. *Trans. Herts Nat. Hist. Soc.*, vol. v, pt. 8 (1890), pp. xxvi–xxvii.

1889.

187. Denton, J. B. On the Replenishment of the Underground Waters of the Permeable Formations of England. *Rep. Brit. Assoc.* for 1888, pp. 797–798 (Chalk basins of Thames and Lea).

188. Hicks, Dr. H. Pre-historic Man in Britain. *Trans. Herts Nat. Hist. Soc.*, vol. v, pt. 5, pp. 147–154. (Geol. Herts, p. 150.)

189. Hopkinson, J. Rambles with the Herts Field Club. From Berkhamsted to Aldbury. *Herts Constitutional Mag.*, vol. ii, pp. 364–367. (Geology, pp. 366–367.)

190. Hopkinson, J. The Geology of London. *Herts Constitutional Mag.*, vol. iii, pp. 235–240. (Herts, p. 238.)

191. Hopkinson, J. Excursion to Boxmoor and Nash Mills. *Proc. Geol. Assoc.*, vol. xi, no. 5, pp. lviii–lxii. Field Meeting . . . . Boxmoor, Bennet's End, and Nash Mills. *Trans. Herts Nat. Hist. Soc.*, vol. v, pt. 8 (1890), pp. xxxvi–xxxviii.

192. Morison, Dr. J. Notes on the Chalk Rock. *Trans. Herts Nat. Hist. Soc.*, vol. v, pt. 7, pp. 199–202. (Herts, p. 200.)

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193. Reynolds' Geological Atlas of Great Britain. 2nd ed. 8vo. London. (Herts, Map 2.)

194. Whitaker. W. Guide to the Geology of London and the Neighbourhood. 5th ed. *Geol. Surv. Memoir.* 8vo. London. (South Herts, see Index.)

195. Whitaker, W. The Geology of London and of Part of the Thames Basin. *Geol. Surv. Memoir.* 2 vols. 8vo. London. Vol. I, Descriptive Geology. (Herts: Upper Silurian Underground, pp. 30–32, 41–46; Gault and Upper Greensand, p. 51; Chalk, pp. 72–74, 77–81; Reading Beds, 195–210; London Clay, 254–255, 264–265; Clay-with-flints, p. 287; Brick-earth, 290; Pebble Gravel, pp. 292–294; Glacial Drift, 303–307; Boulder Clay, p. 323; River Drift, pp. 448–450; Alluvium, p. 472; Pudding-stone, 479; Physical Geology, pp. 483-484, 499; Springs, 503–504; Analyses, 536–537.) Vol. II, Appendices. (Herts: Well-Sections, pp. 43–58; Borings, 276, 289–290.)

1890.

196. Fordham, H. G. A Record of Water-level in a deep Chalk Well at Odsey Grange, Royston, 1878–1888. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pts. 1, 2, pp. 31–36, pls. i, ii. Discussion, pt. 7 (1892), pp. xxii–xxvi.

197. Green, U. Excursion to Shenley. *Proc. Geol. Assoc.*, vol. xi, no. 9, pp. clxix–clxxi. Field Meeting . . . . Shenley and Radlett. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 7 (1892), pp. xxxvi–xxxvii.

198. Green, U., and Dr. J. Morison. Excursion to Potter's Bar and Hatfield. *Proc. Geol. Assoc.*, vol. xi, no. 9, pp. cxl–cxliii.

199. [Hopkinson, J.] Field Meeting . . . . Chandler's Cross, Watford. *Trans. Herts Nat. Hist. Soc.*, vol. v, pt. 8, pp. xx–xxi. (Remarks by U. Green.)

200. [Hopkinson, J.] Field Meeting . . . . Aldbury and Ashridge Park. *Ib.*, pp. xxiii–xxiv.

201. [Hopkinson, J.] Field Meeting . . . . Harpenden. *Ib.*, pp. xxiv–xxv.

202. Hopkinson, J. On Geological Photography in Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 2, pp. 49–52.

203. Hopkinson, J. The River Colne and the Swallow Holes at Potterells. *Proc. Geol. Assoc.*, vol. xi, no. 9, pp. cxl–cxliii. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 7 (1892), pp. xxix–xxxii.

204. Prestwich, Prof. J. On the Relation of the Westleton Beds, or Pebbly Sands of Suffolk, to those of Norfolk, and on their Extension Inland; . . . . Part II. *Quart. Journ. Geol. Soc.*, vol. xlvi, pt. 2, pp. 120–154. (Herts, pp. 137–139, 145, 149, 150.) Pl. vii, Diagram-Sections . . . . (fig. 3, Section from Surrey to Hertfordshire).

205. Prestwich, Prof. J. On the Relation of the Westleton Shingle to other Pre-Glacial Drifts in the Thames Basin, and on a Southern Drift, ... *Ib.*, pp. 155–181. (South Herts, pp. 165–166.) Pl. viii, Map . . . . (includes Herts).

Digitized by Google

206. Whitaker, W. Some Hertfordshire Well-sections.—Second Paper. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 2, pp. 53–64.

207. Whitaker, W. Coal in the South-East of England. *Journ. Soc. Arts*, vol. xxxviii, no. 1953, pp. 543–553. (Cheshunt and Ware, p. 548.)

1891.

208. Anon. Pure Spring Water for London. *Hygiene*, vol. iv, no. 43, pp. 217–218; no. 45, pp. 279–284. (Rickmansworth.)

209. [Binnie, A. R.] On the London Water Supply from the Thames and Lea. (Report to the) *London County Council.* 8vo. London. (Herts, pp. 22–25, and geological map opp. p. 52.)

210. De Rance, C. E. Sixteenth Report of the Underground Waters Committee. *Rep. Brit. Assoc.* for 1890, pp. 352–375. (Herts, pp. 353–354.)

211. Evans, Dr. J. Discussion on paper by J. T. Harrison (No. 213). *Proc. Inst. Civ. Eng.*, vol. cv, p. 59. (Geology of Herts, pp. 51–52.)

212. Geologists' Association. A Record of Excursions made between 1860 and 1890. 8vo. London. (Herts, pp. 149–173.)

213. Harrison, J. T. On the Subterranean Water in the Chalk Formation of the Upper Thames, and its Relation to the Water Supply of London. *Proc. Inst. Civ. Eng.*, vol. cv, pp. 2–25. (Herts, pp. 6–12, and Discussion, pp. 27, 82–87.)

214. Hopkinson, J. Water and Water-supply, with special reference to the Supply of London from the Chalk of Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pts. 5 and 6, pp. 129–161, pl. iv. Discussion, pt. 8 (1892), pp. xlviii–li.

215. Hopkinson, J. Discussion on paper by J. T. Harrison (No. 213). *Proc. Inst. Civ. Eng.*, vol. cv, p. 48. (Herts Geology, pp. 51–52.)

216. Mawley, E. The Percolation of Rain through comparatively Light and through comparatively Heavy Soil. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 6, pp. 175–178. Discussion, pt. 8 (1892), pp. lix–lxi.

217. Monckton, C. Pure Spring Water for London. 4to. London. *Not published* (Rickmansworth.)

218. Monckton, H. W., and R. S. Herries. On some Hill Gravels North of the Thames. *Proc. Geol. Soc.*, vol. xii, pt. 4, pp. 108–114. (Herts, pp. 111–112.)

219. Seeley, Prof. H. G. Handbook of the *London Geological Field Class.* 8vo. London. (Herts, pp. 120–121.)

220. Whitaker, W., and A. H. Green. Preliminary Report on the Possibility of obtaining a Supply of Water for London within the Thames Basin. (Report to the) *London County Council.* 8vo. London. (Herts, pp. 13–15.)

1892.

221. Evans, Dr. J. Discussion on paper by J. W. Grover (No. 224). *Trans. Surveyors' Inst.*, vol. xxiv, pt. vii, pp. 236–238 (Geology of Herts).

Digitized by Google

222. Geological Survey. Index Map. Sheet 12. Scale 4 miles to one inch. (Herts in North-west corner.) Lithographed edition published in 1896.

223. Green, U. Field Meeting . . . . Bennet's End, Hemel Hempstead. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 8, pp. lxii–lxiii, pl. v.

224. Grover, J. W. An Explanation of the London Water Question. *Trans. Surveyors' Inst.*, vol. xxiv, pt. vii, pp. 195–230. (Geology of Herts, pp. 214–219.)

225. [Hopkinson, J.] Field Meeting . . . . Welwyn, Ayot, and Wheathamstead. *Trans. Herts Nat. Hist. Soc.*, vol. vi, pt. 8, pp. lxiv–lxv.

226. [Hopkinson, J.] Field Meeting . . . . St. Albans. *Ib.*, pp. lxvii–lxviii.

227. Hopkinson, J. Excursion to St. Albans. *Proc. Geol. Assoc.*, vol. xii, pt. 8, pp. 342–344. Field Meeting . . . . St. Albans. *Trans. Herts Nat. Hist. Soc.*, vol. vii (1894), pp. xxiii–xxv, pl. iv.

228. Lobley, J. L. The Supply of Water to London in the Near and Distant Future. *County Council Times*. Reprint. 8vo. London. (Herts Geology, pp. 13–18.)

229. Martin, E. A. On the Underground Geology of London. *Science Gossip*, no. 335, pp. 251–254, and no. 337, pp. 11–15 (1893). (Ware and Cheshunt.)

230. Newton, E. T. Note on an Iguanodont Tooth from the Lower Chalk ("Totternhoe Stone") near Hitchin. *Geol. Mag.*, dec. iii, vol. ix, no. 2, pp. 49–50.

1893.

231. Evans, Sir J. Hertfordshire and its Water Supply. *Herts Illustr. Review*, vol. i, no. 1, pp. 4–8.

232. Flower, Major L. The River Lee "up to date." 8vo. London. (Geology, pp. 7–8.)

233. Jukes-Browne, A. J. The Amount of Dissemination of Silica in Chalk considered in Relation to Flints. *Geol. Mag.*, dec. iii, vol. x, no. 12, pp. 541–546. (Analysis of Hitchin chalk, pp. 543–544.)

234. Morison, Dr. J. Ice and its Work. *Trans. Herts Nat. Hist. Soc.*, vol. vii, pt. 5, pp. 147–156. (Herts, pp. 153–156.)

235. Smith, W. G. Man: the Primeval Savage. 8vo. London. (Chiefly Caddington, Herts.)

236. Topley, W. Excursion to Amwell and Chadwell Springs. *Proc. Geol. Assoc.*, vol. xiii, pt. 5, pp. 123–125.

237. Valon, W. A. McI. Inaugural Address. *Trans. Soc. Engineers* for 1893, pp. 1–24. (Geology of New Barnet and South Mimms, pp. 6–7.)

238. Whitaker, W. On Maps showing the Area of Chalk available for Water Supply in the London Basin. *Trans. Sanitary Inst.*, vol. xiii, pp. 243–253. (Includes Herts.)

Digitized by Google

239. Royal Commission on Metropolitan Water Supply. Report of the Royal Commission appointed to enquire into the Water Supply of the Metropolis. Folio. London. (Herts geology, pp. 18–19, 23, 36–39, 49–57.)

240. Maps, Plans, and Diagrams to accompany the Report of the Royal Commission on Metropolitan Water Supply. Folio. London. (Herts: Pl. i.—Contour Map of the Thames and Lea Basins . . . . Pl. ii.—Geological Map of the Thames and Lea Basins . . . . Pl. iii.—Geological Sections. Section No. 1. . . . . through London to the Chiltern Hills across Herts. Pl. xv.—Mr. R. E. Middleton's Water Contour Map of part of Hertfordshire.)

Minutes of Evidence and Appendices to the Report of the Royal Commission on Metropolitan Water Supply. Folio. London. See under the names of the Witnesses as below.

241. Docwra, C. *Min. of Evid.* (Herts, p. 376.) *Append.*—Water Supply from the Lea Valley, etc., pp. 443–444.

242. Dawkins, Prof. W. B. *Min. of Evid.* (Herts, pp. 33–36.) *Append.*—Report on Supplemental Supply from Wells in the London Area, pp. 419–425 (chiefly Herts).

243. Evans, Sir J. *Min. of Evid.* (Herts, pp. 367–375.) *Append.*—Statement [chiefly on Percolation], pp. 441–443 (Herts).

244. Hopkinson, J. *Min. of Evid.* (Herts, pp. 304–307.) *Append.*—Hertfordshire Rainfall, Percolation, and Evaporation, pp. 374–389. Reprinted, with supplementary tables, in *Trans. Herts Nat. Hist. Soc.*, vol. ix, pt. 2 (1896), pp. 33–72, pl. i.

245. Latham, B. *Min. of Evid.* (Herts, pp. 277, 281.)

246. Middleton, R. E. *Append.*—Report on an Inquiry into the alleged Depletion of Rivers, Springs, and Wells in Hertfordshire, pp. 540–669. (Geology, pp. 544, 554, 566.)

247. Smith, U. A. *Append.*—Statement [chiefly on Springs and Wells], pp. 389–411. (Herts geology, p. 396.)

248. Topley, W. *Min. of Evid.* (Herts, pp. 313–322.) *Append.*—Areas of the various Geological Formations . . . . (Herts, p. 414 and folding Table opposite.)

249. Whitaker, W. *Min. of Evid.* (Herts, pp. 349–356, 438.) *Append.*—Memorandum on Swallow-holes in the Chalk of the Thames Basin, pp. 430–432. On the Chalk of the London Basin, pp. 433–435. (Partly Herts.)

1894.

250. Davis, A. M. Excursion to Elstree. *Proc. Geol. Assoc.*, vol. xiii, pt. 10, p. 387.

251. Holmes, T. V. The Geology of the Lea Valley. *Essex Naturalist*, vol. viii, pp. 198–201.

252. Holmes, T. V. Excursion to Harefield. *Proc. Geol. Assoc.*, vol. xiii, pt. 10, pp. 281–283.

253. Hopkinson, J. Reminiscences of some Rambles with the Hertfordshire Natural History Society. *Herts Illustr. Review*, vol. ii, pp. 275–283. (Geology, pp. 277–282.)

Digitized by Google

254. [HOPKINSON, J.] Field Meeting . . . . Rickmansworth and Harefield. *Trans. Herts Nat. Hist. Soc.*, vol. vii, pt. 8, pp. xlv–xlvi, pl. vi.

255. WHITAKER, W., and A. J. JUKES-BROWNE. On Deep Borings at Culford and Wingfield, with Notes on those at Ware and Cheshunt. *Quart. Journ. Geol. Soc.*, vol. l, pt. 3, pp. 488–514. (Ware, pp. 501–507; Cheshunt, pp. 508–511.)

1895.

256. BROWN, A. M. [On the Dundale Spring, Tring.] *Trans. Herts Nat. Hist. Soc.*, vol. viii, pt. 4, p. xxxvii.

257. HILL, W. [On the Lake-bed near Hitchin Hill.] *Trans. Herts Nat. Hist. Soc.*, vol. viii, pt. 4, p. xxxvii.

258. HILL, W., and A. J. JUKES-BROWNE. On the Occurrence of Radiolaria in Chalk. *Quart. Journ. Geol. Soc.*, vol. li, pt. 4, pp. 600–608. (Herts, pp. 602, 605–608, pl. xxii.)

259. [HOPKINSON, J.] Field Meeting . . . . Luton, Caddington, and Dunstable. *Trans. Herts Nat. Hist. Soc.*, vol. viii, pt. 4, pp. xxvii–xxx.

260. HOPKINSON, J. The Relative Advantages of Hard and Soft Water, with Special Reference to the Supply of Watford. *Trans. Herts Nat. Hist. Soc.*, vol. viii, pt. 5, pp. 101–115.

261. KING, A. On the Advantages of a Supply of Soft Water for the Town of Watford. *Trans. Herts Nat. Hist. Soc.*, vol. viii, pt. 5, pp. 116–124.

262. MURRAY'S Handbook for Hertfordshire, Bedfordshire, and Huntingdonshire. 8vo. London. (Geology of Herts, p. [4].)

263. PRESTWICH, J. A Geological Enquiry respecting the Water-bearing Strata of the Country around London, ... Re-issue, with additions by the author. 8vo. London. (Herts, pp. vi, 13, 28–33, 40–54.)

264. WHITAKER, W. On the Chalk of the London Basin in regard to Water Supply. *Geol. Mag.*, dec. iv, vol. ii, pp. 360–366 (partly Herts).

1896.

265. EVANS, Sir J. Anniversary Address—The Stone Age in Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. viii, pt. 7, pp. 167–187, pls. ix–xiv.

266. FRANCIS, J. On the Dip of the Underground Palæozoic Rocks at Ware and Cheshunt. *Rep. Brit. Assoc.* for 1895, pp. 441–454.

267. FRANKLAND, Dr. E. The Past, Present, and Future Water Supply of London. *Proc. Roy. Inst.*, vol. xv, pt. 1, pp. 53–74. (Geology of Lea valley, p. 72.) *Science Progress*, vol. v, no. 27, pp. 163–189. (Lea valley, p. 186.)

268. HILL, W., and W. H. MONCKTON. Excursion to Hitchin. *Proc. Geol. Assoc.*, vol. xiv, pt. 10, pp. 415–419.

269. PEIRCE, W. G. Inaugural Address [of the President]. *Trans. Soc. Engineers* for 1895, pp. 1–31. (Lea valley Chalk-water, p. 15.)

Digitized by Google

270. Salter, A. E. "Pebbly Gravel" from Goring Gap to the Norfolk Coast. *Proc. Geol. Assoc.*, vol. xiv, pt. 9, pp. 389–404. (Herts, pp. 390–395, 402, 403.)

271. Salter, A. E. Excursion to Potter's Bar and Hatfield. *Proc. Geol. Assoc.*, vol. xiv, pt. 9, pp. 420–421.

272. Thresh, Dr. J. C. Water and Water Supplies. 8vo. London. (Water in Lea Valley, pp. 79, 83–84; Herts Wells, pp. 323, 324.)

273. Woods, H. The Mollusca of the Chalk Rock: Part 1. *Quart. Journ. Geol. Soc.*, vol. lii, pt. 1, pp. 69–98, pls. ii–iv. (Herts, pp. 69, 73–84, 86–90, 92, 94–96.)

1897.

274. Chapman, F. Ostracoda from the *Chara*-marl of Hitchin, Herts. *Ann. Nat. Hist.*, ser. iv, vol. xix, pp. 591–597, pl. xv.

275. Evans, Sir J. The Ancient Stone Implements, Weapons, and Ornaments of Great Britain. 2nd ed. 8vo. London. (Herts, see Index.)

276. Irving, Dr. A. Excursion to Bishop's Stortford. *Proc. Geol. Assoc.*, vol. xv, pt. 5, pp. 193–197.

277. Reid, C. The Palæolithic Deposits at Hitchin and their Relation to the Glacial Epoch. *Proc. Royal Soc.*, vol. lxi, pp. 40–48. Reprinted in *Trans. Herts Nat. Hist. Soc.*, vol. x, pt. 1 (1898), pp. 14–22.

278. Warren, H. Water-levels in the Chalk near Royston. *Trans. Herts Nat. Hist. Soc.*, vol. ix, pt. 6, pp. 209–214, pl. vi.

279. Whitaker, W. Address to Section III. (Chemistry, Meteorology, and Geology.) *Journ. Sanitary Inst.*, vol. xviii, pt. 3, pp. 304–316. (Herts Geology, pp. 305–312.)

280. White, H. J. O. On the Origin of the High Level Gravel with Triassic Débris adjoining the Valley of the Upper Thames. *Proc. Geol. Assoc.*, vol. xv, pt. 4, pp. 157–174. (Herts, p. 174 and Map.)

281. Woods, H. The Mollusca of the Chalk Rock: Part 2. *Quart. Journ. Geol. Soc.*, vol. liii, pt. 3, pp. 377–404, pls. xxvii, xxviii. (Herts, pp. 382, 385–388.)

282. Woodward, H. B. Soils and Sub-soils, from a Sanitary Point of View; with special reference to London and its Neighbourhood. *Geol. Surv. Memoir.* 8vo. London. (South Herts, see Index.)

283. Woodward, H. B. The Chalky Boulder-clay and the Glacial Phenomena of the Western Midland Counties of England. *Geol. Mag.*, dec. iv, vol. iv, no. 11, pp. 485–497. (Herts, pp. 485, 490, 496, 497.)

1898.

284. Anon. Water Supply from the Chalk. *The Builder*, vol. lxxv, pp. 545–547. (Herts, p. 546.) Continued in 1899, vol. lxxvi, pp. 29–31. (Herts, pp. 30–31.)

285. Dawkins, Prof. W. B. On the Relation of Geology to Engineering. *Proc. Inst. Civ. Eng.*, vol. cxxxiv, pp. 254–277. (Chalk water in Herts, pp. 259–266.)

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286. [HOPKINSON, J.] Field Meeting . . . . Aldbury and Ashridge Park. *Trans. Herts Nat. Hist. Soc.*, vol. ix, pt. 7, pp. xxx–xxxi.

287. [HOPKINSON, J.] Field Meeting . . . . Hitchin. *Ib.*, pp. xxxv–xxxvi.

288. [HOPKINSON, J.] Field Meeting . . . . The Valley of the Bourne, Boxmoor. *Trans. Herts Nat. Hist. Soc.*, vol. ix, pt. 8, pp. lxv–lxvii. (Remarks by W. Whitaker, p. lxvi.)

289. [HOPKINSON, J.] Field Meeting . . . . Sopwell, St. Albans. *Ib.*, pp. lxxi-lxxiii. (Remarks by W. Whitaker, pp. lxxii-lxxiii.)

290. HOPKINSON, J., and A. E. SALTER. Excursion to Ayot Green and Hatfield Hyde. *Proc. Geol. Assoc.*, vol. xv, pt. 8, pp. 308–310.

291. IRVING, Dr. A. On the Geology of the Stort Valley . . . . with special reference to the Plateau Gravels. *Proc. Geol. Assoc.*, vol. xv, pt. 6, pp. 224–237. (Well-section at Bishop's Stortford, pp. 224–225; "Herts Puddingstone," pp. 236–237.)

292. PRESTWICH, Sir J. Memoranda chiefly on the Drift Deposits in various parts of England and Wales: . . . . Ed. by H. B. Woodward. *Geol. Mag.*, dec. iv, vol. v, no. 9, pp. 407–417. (Herts, pp. 408, 409.)

293. SALTER, A. E. Pebbly and other Gravels in Southern England. *Proc. Geol. Assoc.*, vol. xv, pt. 7, pp. 264–285. (Herts, p. 274.)

294. SHRUBSOLE, O. A. On some High-level Gravels in Berkshire and Oxfordshire. *Quart. Journ. Geol. Soc.*, vol. liv, pt. 4, pp. 585–600, pl. xxviii. (Herts, pp. 587, 589.)

295. WHITAKER, W. Anniversary Address—Chalk Water in Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. x, pt. 1, pp 1–13.

296. WHITAKER, W. [and others]. Sheet 46 S.E. of the Map of the *Geological Survey*. Scale 1 inch to a mile. Drift edition. Dated 1898, issued in 1899. (Stevenage, Welwyn, Redbourn, etc.)

1899.

297. BLAKE, Rev. J. F. Excursion to Bushey and Harrow Weald. *Proc. Geol. Assoc.*, vol. xvi, pt. 2, pp. 243–244.

298. HOPKINSON, J. The Chadwell Spring and the Hertfordshire Bourne. *Trans. Herts Nat. Hist. Soc.*, vol. x, pt. 3, pp. 69–83, pl. i.

299. HOPKINSON, J. Excursion to Rickmansworth and Harefield. *Proc. Geol. Assoc.*, vol. xvi, pt. 5, pp. 244–246.

300. MONCKTON, H. W. On a Section in the Westleton Beds at Ayot Brickfield. *Geol. Mag.*, dec. iv, vol. vi, no. 2, pp. 59–60.

301. RICHARDS, H. C., and W. H. C. PAYNE. London Water Supply. 2nd ed. 8vo. London. (Geology of Herts, pp. 136–137, 140, 146, 148–151.)

302. SISLEY, R. The London Water Supply: . . . . 4to. London. (Chadwell Spring, p. 30; wells in Lea valley, pp. 42–44.)

303. WHITAKER, W. Anniversary Address—Geological and other Work in Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. x, pt. 4, pp. 105–118.

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1900.

304. [Green, U.] Excursion to Boxmoor. *Proc. Geol. Assoc.*, vol. xvi, pt. 10, pp. 501–502.

305. Hill, W. Excursion to Hitchin and Arlesey. *Proc. Geol. Assoc.*, vol. xvi, pt. 8, pp. 446–447.

306. Jukes-Browne, A. J., and W. Hill. The Cretaceous Rocks of Britain. Vol. I. The Gault and Upper Greensand of England. *Mem. Geol. Survey.* (Herts, pp. 280–283, 370–371, 375.)

307. Lones, T. E. The Gravels, Sands, Clays, and Loams of Western Hertfordshire. *Trans. Herts Nat. Hist. Soc.*, vol. x, pt. 5, pp. 153–164, pl. iii.

308. Salter, A. E. Excursion to Hertingfordbury, Bayford, and Brickendon Green. *Proc. Geol. Assoc.*, vol. xvi, pt. 8, pp. 447–448.

309. Sollas, Prof. W. J. On a Possible Coalfield in the London Basin. *Rep. Brit. Assoc.* for 1900, pp. 739–740 (South Herts). Dated 1900, issued in 1901.

310. Whitaker, W. The Anniversary Address of the President. *Quart. Journ. Geol. Soc.*, vol. lvi, pt. 2, pp. li–lxxxviii. Underground Geology in the South-east of England, p. lxxi (Herts: Upper Greensand, p. lxxv; Gault, p. lxxvii; Older Rocks, pp. lxxxiv–lxxxv). Part 2 reprinted in *Trans. Inst. Mining Eng.*, vol. xix, pt. 4, pp. 428–446. (Herts, pp. 434–437, 443.)

Royal Commission on Water Supply within the limits of the Metropolitan Water Companies. Reports, etc., 6 parts. Folio. London. See evidence as below.

311. Latham, B. *Minutes of Evidence*, vol. ii, pp. 583–587. (Water supply from Lea valley.)

312. Smith, U. A. *Minutes of Evidence*, vol. ii, pp. 572–582 (Water supply from Lea valley). *Appendices*, pp. 181–192 (Flow of Chadwell Spring and River Lea).

Additions to List to 1883.

1815.

b1. Anon. History of Verulam and St. Albans. 12mo. St. Albans. (Pudding Stone, p. 239.)

1836.

b2. Fitton, Dr. W. H. Observations on some of the Strata between the Chalk and the Oxford Oolites, in the South-East of England. *Trans. Geol. Soc.*, ser. 2, vol. iv, pp. 103–388. (Herts, pp. 293–305.) Pl. ix, Map of part of the South-East of England (including Herts).

b3. Gravatt, W. Some Account of several Sections through the Plastic Clay formation in the vicinity of London. *Trans. Inst. Civ. Eng.*, vol. i, pp. 151–153. (Tring Hill, p. 151.)

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1842.

b4. MYLNE, R. W. On the Supply of Water from Artesian Wells in the London Basin, ... *Trans. Inst. Civ. Eng.*, vol. iii, pp. 229–244. (Lea valley, p. 233.)

1850.

b5. HOMERSHAM, S. C. Report to the Directors of the London (Watford) Spring-water Company. 8vo. London. (Watford water, pp. 11–12; Section of experimental well at Bushey Meadows, Herts, pl. opp. p. 42; Geological map and section, including Herts, opp. p. 58.)

b6. HOMERSHAM, S. C. Review of the Report of the General Board of Health on the Supply of Water to the Metropolis; . . . . 8vo. London. (Appendix C, Analyses of Watford water, pp. 49–52.)

b7. VETCH, Capt. General Board of Health. Report on the Supply of Water to the Metropolis. 8vo. London. Appendix No. II, pp. 47–61. (Herts, pp. 48–54.)

1851.

b8. GRAHAM, T., W. A. MILLER, and A. W. HOFFMAN. Report by the Government Commission on the Chemical Quality of the Supply of Water to the Metropolis. 8vo. London. (On the Water proposed to be supplied from Watford, pp. 34–40.)

1855.

b9. DICKINSON, J. Discussion on paper by P. W. Barlow "On some peculiar features of the Water-bearing Strata of the London Basin." *Proc. Inst. Civ. Eng.*, vol. xiv, pp. 71–72 (Herts).

1857.

b10. CAMPBELL, D. On the Source of the Water of the deep Wells in the Chalk under London. *Quart. Journ. Chem. Soc.*, vol. ix, pp. 21–27. (Analysis of Watford chalk-water, p. 24.)

1862.

b11. BEARDMORE, N. Manual of Hydrology: . . . 8vo. London. (Percolation at Apsley Mill, pp. 124–129; Rivers Lee and Colne, pp. 144–147; Hinxworth experiments, p. 148.)

b12. BURNELL, G. R. On some recently-executed Deep Wells and Borings. *Journ. Soc. Arts*, vol. x, no. 480, pp. 156–164. (Lea and Coln (*sic*) valleys, p. 161.) J. HAWKSHAW, in discussion, p. 163 (Watford).

1865.

b13. BLENKARN, J. The Absorbing Well, New Barnet, Herts. *Builder*, vol. xxiii, no. 1154, pp. 189–190, 193.

b14. GLYN, ——. Discussion on paper by B. Latham (No. b15). *Trans. Soc. Engineers* for 1864, pp. 252–261. (Wells in Herts, p. 258.)

b15. LATHAM, B. Upon the Supply of Water to Towns. *Trans. Soc. Engineers* for 1864, pp. 199–251. (Sections of wells in Lea valley, pp. 245–246, 249, pl. v.)

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1867.

b16. Colburn, Z., and W. H. Maw. The Waterworks of London, ... 8vo. London. (Geology of Lea valley, pp. 2, 3.)

1872.

b17. Prestwich, J. The Anniversary Address of the President. *Quart. Journ. Geol. Soc.*, vol. xxviii, pt. 1, pp. xxix–xc. Our Springs and Water Supply, pp. liii–lxxiii (partly Herts).

1874.

b18. Lucas, J. Horizontal Wells . . . . 4to. London. (Tring cutting, p. 29; Bishop's Stortford well, p. 30, Tables ii and iii.)

1875.

b19. Jukes-Browne, A. J. On the Relations of the Cambridge Gault and Greensand. *Quart. Journ. Geol. Soc.*, vol. xxxi, pt. 2, pp. 256–316. (Ashwell and Hitchin, p. 261.)

1876.

b20. Evans, Dr. J. The Anniversary Address of the President. *Quart. Journ. Geol. Soc.*, vol. xxxii, pt. 2, Proc., pp. 53–121. Water-supply of the Metropolis, pp. 115–121 (partly Herts). Also in *Nature*, vol. xiii, pp. 376–378.

b21. Evans, Dr. J. Water-supply of the Metropolis [from the Chalk of Herts]. *Nature*, vol. xiii, p. 425.

b22. Frankland, Dr. E. The Water Supply of the Metropolis [from the Chalk of Herts]. *Nature*, vol. xiii, pp. 392–393.

b23. Humber, W. A Comprehensive Treatise on the Water Supply of Cities and Towns . . . 4to. London. Chap. iv, Springs and Water-bearing Formations. (Herts, pp. 44, 45, 52–56.)

1877.

b24. Evans, Dr. J. Discussion on paper by J. Lucas "On the Chalk Water System." *Proc. Inst. Civ. Eng.*, vol. xlvii, p. 122. (Herts, pp. 122–126.)

b25. Homersham, S. C. Discussion on paper by J. Lucas "On Hydrogeology" . . . . *Trans. Inst. Surveyors*, vol. ix, pp. 218–224. (Geology of Herts, pp. 223–224; section through Herts, opp. p. 232.)

1878.

b26. De Rance, C. E. On the Palæozoic and Secondary Rocks of England as a Source of Water Supply. *Trans. Manchester Geol. Soc.*, vol. xiv, pt. 19, pp. 403–440. (Herts, pp. 430–431.)

b27. Prestwich, Prof. J. On the Section of Messrs. Meux & Co.'s Artesian Well . . . .; and on the probable Range of the Lower Greensand and Palæozoic Rocks under London. *Quart. Journ. Geol. Soc.*, vol. xxxiv, pt. 4, pp. 902–913. (Herts, p. 908; Section showing Carboniferous and Devonian strata under Herts, p. 910.)

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1879.

b28. Dewalque, G. Sur le prolongement de la faille eifeliene. *Ann. Soc. Géol. Belge*, t. vi, pp. cxxxv–cxxxviii. (List of fossils from Ware boring, in discussion, p. cxxxviii.)

b29. Goslin, S. B. Suggestions for dividing England and Wales into Watershed Districts. *Journ. Soc. Arts*, vol. xxvii, no. 1393, pp. 796–804. (Herts geology, p. 803.)

1880.

b30. Price, F. G. H. A Monograph of the Gault . . . . 8vo. London. (Herts, p. 32; list of fossils from Puttenham, pp. 44–81.)

b31. Wood, S. V., jun. The Newer Pliocene Period in Britain. *Quart. Journ. Geol. Soc.*, vol. xxxvi, pt. 4, pp. 457–528. (Bricket Wood, pp. 508, 511.)

1881.

b32. Etheridge, R. Anniversary Address of the President. *Quart. Journ. Geol. Soc.*, vol. xxxvii, pt. 2, Proc., pp. 37–235. The Extension of the Older or Palæozoic Rocks below the Newer or Secondary Formations, pp. 227–235 (chiefly Herts).

b33. Hull, Prof. E. The Coal-fields of Great Britain: . . . . 4th ed. 8vo. London. Possible occurrence of Coal under the South of England, p. 349 (Herts, pp. 354–356).

b34. Phillips, J. A. On the Constitution and History of Grits and Sandstones. *Quart. Journ. Geol. Soc.*, vol. xxxvii, pt. 1, pp. 6–28. (Herts Puddingstone, p. 18.)

b35. Smith, W. G. Flint Implements in the Drift. *Midland Naturalist*, vol iv, p. 20. (Near Hertford and Ware.)

b36. Whitaker, W., and J. Hopkinson. Excursion to Watford. *Proc. Geol. Assoc.*, vol. vi, no. 5, pp. 191–194.

1882.

b37. Judd, Prof. J. W. The possibility of finding workable Coal-seams under the London Area. *Nature*, vol. xxv, no. 640, pp. 311–313. (Turnford and Ware.)

b38. Judd, Prof. J. W. The Search for Coal under London. *Ib.*, no. 642, p. 361. (Turnford.)

b39. Lemon, W. G. Address. Deep Borings in the S.E. of England. *Rep. West Kent Nat. Hist. Soc.* for 1881–2, pp. 9–20.

b40. Wood, S. V., jun. The Newer Pliocene Period in England, *Quart. Journ. Geol. Soc.*, vol. xxxviii, pt. 4, pp. 667–745. (Herts. pp. 678–679.)

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CONTENTS:

		PAGES
12.	Address.—Progress during the Nineteenth Century. By the President, Lewis Evans, F.S.A., F.R.A.S.	105–118
13.	Notes on the Fish of the Upper Lea. By James Saunders, A.L.S.	119–120
14.	The Climate of Hertfordshire, deduced from Meteorological Observations taken during the Twelve Years 1887–1898. By John Hopkinson, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C. E. (Plate VII.)	121–134
15.	Report on Phenological Phenomena observed in Hertfordshire during the Year 1901. By Edward Mawley, Vice-Pres. R. Met. Soc., F.R.H.S.	135–141
16.	Notes on Birds observed in Hertfordshire during the Year 1901. By William Bickerton	142–144

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XII.

ADDRESS.

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PROGRESS DURING THE NINETEENTH CENTURY.

By the President, Lewis Evans, F.S.A., F.R.A.S.

Delivered at the Anniversary Meeting at Watford, 4th March, 1902.

Ladies and Gentlemen,—

I trust that you will excuse me for straying somewhat from matters immediately connected with Natural History this evening, for it seemed to me that as this happens to be the first Annual Address to the Society in the twentieth century, I might with advantage bring together a few facts in illustration of the progress made during the past hundred years both in our own country and the world at large in almost every conceivable direction, and especially in our own neighbourhood and our own county.

The 1st of January, 1801, the day on which the Act of Union incorporated the Irish Parliament in that of Great Britain, found the United Kingdom apparently in a very bad case. The war with France had already lasted for eight years, and had cost the nation nearly £160,000,000; and, at the opening of the new century, England, with about 16,000,000 inhabitants, found herself engaged single-handed in trying to stem Napoleon's tide of conquest and to hold in check the French nation numbering 40,000,000; and whilst on the one hand, in 1801, wheat was costing 119*s.* per quarter, almost everything was exceedingly dear, and taxes were extremely high, on the other hand Consols were down to 62·63, wages were falling, and there was so much distress and discontent amongst the working classes as to cause riots throughout the country. The reigning monarch was a poorly-educated and narrow-minded man, who was, moreover, subject to mental derangement; and although the government of the country was in the able hands of the younger Pitt (who had become Prime Minister at the age of 23), his efforts at parliamentary reform had been fruitless, and the House of Commons was in no sense representative either of the wealth or intelligence of the country.

As with the nineteenth century, so with the twentieth; its commencement was signalized by an Act of Union, namely, the inauguration of the Commonwealth of Australia; a political movement likely to be of the utmost importance to the Empire, and one quite unforeseen a century ago, when out of the whole Australian

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continent we only occupied one very small portion, which was misused for the base purpose of a penal settlement.

In a similar way the new century found this country engaged in a war, which, though of less European importance than the Napoleonic wars of a hundred years before, was still one of vital importance to the Empire, and one which had in the short period of fourteen months increased the national debt by more than £50,000,000, and as a guerilla war was still destined to cost the country many valuable lives and much treasure. There could, however, be no doubt as to its ultimate result, and the disturbed territory had already become part of the British Empire, and was rapidly coming under British administration. The internal condition of the country was good, and its financial credit secure; with Consols at 97½, corn at 27*s.* a quarter, all the necessaries of life cheap, employment plentiful, and wages good. The national debt had indeed advanced during the previous century from about £620,000,000 to £705,000,000, or allowing for certain national assets to £673,000,000; but in the same period the population of Great Britain had increased from about 16,000,000 to 41,000,000, so that the actual debt per head had fallen from about £38 to £16 10*s.*, and this in spite of a very great reduction of taxation. The reigning Monarch was the most intelligent and best beloved of any that had ever sat on the throne, and the government of the country was in the hands of able ministers supported by an overwhelming majority in a free and reformed parliament, and one which fully represented the feelings of the people.

But probably the best measure of our progress as a nation can be got from a comparison between the condition of the labouring classes at the beginning and end of the century.

At the early part of this period the condition of the labouring classes was indeed miserable; the increase in population, combined with the introduction of machinery, led to the lowering of wages, whilst bad harvests, combined with the heavy taxation, made living dearer than ever before; and in order to prevent thousands from dying of famine, and to provide at least a living wage, outdoor poor relief was distributed on a scale hitherto unknown, the poor-rate almost reaching 20*s.* in the pound in some parts of this county. The quartern loaf, which had been as high as 1*s.* 5*d.* in 1800, rose to 1*s.* 11*d.* in 1801; and during nearly twenty years the same distress prevailed, the climax arriving about 1816, when the male population was greatly increased by the soldiers discharged at the end of the war, while at the same time a rapid introduction of machinery had for the moment lessened the sources of employment,

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with the result of Luddite and machine-breaking riots all over the country. Luckily our own county seems to have been almost free from any of these outbreaks, the only incident connected with them of which I have heard being the stoppage by the Magistrates at St. Albans in the Summer of 1816 of a waggon laden with coal which was being drawn to London by distressed Staffordshire colliers in order to excite the public pity. The coal was bought and the men went quietly home.

On the other hand, at the beginning of the twentieth century employment was plentiful in all parts of the country and wages were at least twice as high as they were in 1800, whilst the cost of bread and all other necessaries of life, including clothing, but with the exception possibly of meat, was not more than half what it was in 1801. House rent was certainly higher, at any rate in the towns, but the accommodation given and insisted on was infinitely superior to anything dreamt of at the beginning of the previous century.

The work-people themselves, instead of being the ignorant and brutalized beings, of whom not one in ten could read or write, who degraded our country a hundred years ago, are now a fairly-educated and very intelligent set of men and women, who take an active interest both in local and imperial politics, and who try to keep themselves acquainted with the history and doings of their times as nearly as the ½*d.* newspaper will let them. Judicious legislation as regards such matters as education, factory management, and labour regulations, poor relief, etc., has done much for them; whilst the numerous and well-managed Friendly Societies, together with such institutions as Savings Banks and Building Societies, have promoted thrift. This great improvement could not have taken place without the great advance shown during the past century in all departments of knowledge, not only social and political, but also in all branches of science, and in the improvement of arts and manufactures arising therefrom.

The chief credit for the industrial development of the century must be ascribed to the steam-engine. This invention had become a practical power for raising water in the hands of Savery and Papin about 1700 (1698–1705), and had been made self-acting as early as 1713 by the ingenuity of a boy named Potter. Many other improvements were also made in it during the eighteenth century, such as the introduction by Watt of a separate condenser in 1769, his method of making the engine double-acting in 1782, Hornblower's idea of the two-cylinder compound engine in 1781, and the adoption of a higher steam-pressure at the instigation

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of Trevethick and Oliver Evans, together with Woolf's development of compounding two cylinders together. Still, it was only about the year 1800, and after the many minor improvements of Boulton and Watt, that it became generally available for mill purposes, with the result that large factories could be established in those centres which, owing to abundance of raw material, labour, coal, carriage facilities, a local market, or the combination of these advantages, were best suited to various manufactures.

Out of the simple fact of the aggregation of the more intelligent workmen and mechanics in large factories arose constant improvements in machinery which have reacted through all branches of trade and manufacture. The fuel-consumption of the steam-engine gives some idea of the enormous progress which has been made, for whereas each horse-power at the beginning of the century required 120 lbs. weight of steam, the same work is now done by about 12 lbs., and in the same period the pressure of steam in general use has gone up from 4 or 5 lbs. per square inch to anything between 120 and 250 lbs.

Probably the steam-engine has most directly assisted progress by the facilities it has given to traffic and communication, for until steam came to the rescue all travelling was both slow and dangerous. It must be remembered that at the beginning of the last century the roads in this country were extremely bad and much neglected; the use of mail coaches had only been introduced about 15 years, and they ran on comparatively few roads at an average speed of something like 8 miles an hour. A post-chaise journey even to so desirable a destination as Gretna Green was not lightly to be undertaken, and a journey from London to Edinburgh occupied 60 hours. The serious improvement of the roads was not taken in hand much before 1823, when a great number of the Turnpike Trust Acts were passed.

The first use of steam-power on a railway dates from 1804, when Trevethick successfully applied it on a horse-tramway in Wales, but no important use was made of it until its adoption on the Stockton & Darlington Railway, which was opened in September, 1825, when a locomotive driven by George Stephenson drew a train of 34 vehicles weighing in all 92 tons at from 10 to 15 miles an hour, a signalman on horseback riding in front of it. In 1830 the Manchester & Liverpool Railway was opened, on which ran Robert Stephenson's celebrated engine the "Rocket," the prototype of the modern locomotive, with a tubular boiler, the exhaust blast helping the chimney-draught, and a steam-pressure of 50 lbs.

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Next, in 1836, our line, then known as the London & Birmingham, was opened as far as Boxmoor; and in 1838 to Birmingham, when the first through train made the journey at over 20 miles an hour. Since then railways have gone on improving both over, on, and under-ground, until it seems that the limit of safety on the ordinary line is somewhere about 100 miles per hour. In order to make farther progress in the direction of speed, it is now proposed to adopt an overhead mono-rail system for the new suggested high-speed railway between Manchester and Liverpool. The mono-rail idea is of course no new one, having been employed years ago with horse-traction, an early instance of which is recorded at Cheshunt, where in 1825 an overhead mono-rail with horse-traction was used for taking bricks to the river. A somewhat similar idea has been followed out in the many aërial wire railways which are used chiefly for the carriage of minerals and timber in mountainous districts.

Another important development of land-travel has been the bicycle, which was first practically used about 35 years since, although its remote ancestor, the "hobbyhorse," appeared as long ago as 1815. The bicycle, on account of its comparative speed and great cheapness, now occupies a position of its own in locomotion from which there seems little likelihood of its immediate deposition. The most recent method of locomotion, the auto-mobile or motor-car, long since foreshadowed by the abortive road locomotive first made in France by Cugnot so long ago as 1769, and in more recent days by the cumbrous traction engine, must still be considered in its infancy, as its practical development only commenced in 1895; but no doubt it has a great future before it as soon as it has undergone a chastening improvement in its details, accompanied by an enormous reduction in its prime cost.

At the commencement of the century inland navigation had received a great impulse in this country at the hands of "Francis, 3rd Duke of Bridgewater and Father of Inland Navigation," who died in 1803, and whose monument in Ashridge Park forms so conspicuous a local landmark. In 1800 the Grand Junction Canal was opened, and this valley had the benefit of cheap carriage; probably few now realize how extremely useful this and other canals have been, and indeed still are, nor how great a future they are destined to have when some satisfactory method has been devised for applying electric traction to the barges.

Again, it is the steam-engine which has caused such enormous development of navigation during the last century. The first experimental application of steam-power for this purpose was made by W. Symington in a boat built for Mr. P. Miller, which ran at

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the rate of 5 miles an hour on Dalswinton Loch in Scotland in 1788; this was followed by the "Charlotte Dundas," which plied in the Forth and Clyde Canal in 1802, Fulton's boat "Clermont" used on the Hudson river in 1807, the "Comet" on the Clyde in 1812, and the "Savannah" which crossed the Atlantic in 1819.

Captain Ericson devised the screw propeller in 1837, and the Cunard line commenced running in 1840, when ocean navigation became firmly established.

The development of steam navigation has been thus epitomized: in 1833 a transition was taking place from sails to wooden paddles; in 1843 from wooden to iron hulls; in 1850 from paddles to screws; in 1879 from iron to steel hulls; and in 1889 from single to twin screws. The principal changes in the engine have been a great increase in the speed of the piston, the use of surface-condensers, greatly increased steam-pressures, and the device of triple and quadruple expansion. The speed of Ocean Steamers has now reached 23 knots or 26½ miles per hour, whilst on torpedo-boat destroyers engined with Parsons' steam turbine a speed of over 35 knots or more than 40 miles an hour has been successfully accomplished.

It will not do at this date to neglect all mention of aërial locomotion, for great progress has been made with ballooning since 1783, when Vincent Lunardi made the first ascent in Britain, starting from Finsbury and landing safely at Ware in this county. The successful navigation of the cigar-shaped balloon of Mr. Santos Dumont round the Eiffel Tower last year marks a great advance in aëronautics, and will no doubt give a great impetus to the inventors both of steerable balloons and of flying machines.

With improved methods of locomotion there naturally came great changes in the methods of communication. A penny post for London had been established as early as 1681, but a retrograde step was taken in 1801, when the rate for this London local post was put up to 2*d.*; the rate to other parts of the country varied with the distance, and in 1837 some of the London postal rates were as follows:—to Brighton 8*d.*, Edinburgh 1*s.* 1½*d.*, Belfast 1*s.* 4*d.*, the distance rates being as follows:—Under 15 miles, 4*d.*; 15 to 20, 5*d.*; 20 to 30, 6*d.*; 30 to 50, 7*d.*; 50 to 80, 8*d.*; 80 to 120, 9*d.*; 120 to 170, 10*d.*; 170 to 230, 11*d.*; 230 to 300, 1*s.*; and so on, with an extra ½*d.* in Scotland. Newspapers, on each of which a tax was levied (a tax which in 1815 was as high as 4*d.* a copy, though it was much reduced in 1836), were carried free.

In consequence of agitation, and especially owing to a pamphlet on Post Office Reform published by Rowland Hill in 1837, a great

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change was made on 6th May, 1840, when penny postage was started for the United Kingdom, and the old black penny and blue twopenny adhesive stamps were issued as well as the 1*d.* and 2*d.* Mulready envelopes and wrappers. Hertfordshire is to a certain extent associated with this issue, as all the paper for the Mulready envelopes was made at Apsley Mills; it had silk threads running through it to prevent forgery, an invention patented by Mr. John Dickinson. In 1839 about 82 million letters and papers passed through the post, as compared with 3,000 million in 1900, when the penny post had been practically extended to the whole empire.

For the more rapid conveyance of news the prehistoric fire-beacon had already been superseded by the telegraph in 1801; not the electric telegraph of modern times, but a series of semaphores worked on high buildings or eminences at a distance of 8 to 12 miles from one another. A semaphore station of this sort is shown in old prints on the top of the clock-tower at St. Albans. In favourable weather messages could be sent with great speed by this means either by night or day; for instance, the time taken to send a message from London to Deal (72 miles) was only 3 minutes.

An electric telegraph had been suggested in the eighteenth century, and some more or less successful attempts had been made to utilize for this purpose the so-called frictional electricity, in conjunction with pith balls; but the originators of the modern telegraph were Wheatstone and Cook, who took out a patent for it in 1837 and made the first successful installation on the London & Blackwall Railway in that year. At about the same date or just afterwards Morse devised, in the United States of America, an electric telegraph, in which he first used the dot and dash of the Morse code. A line was opened on the Great Western Railway from London to Slough soon afterwards. By 1845 there were two or three more lines in use in the country; and in January of that year public attention was forcibly directed to their merits in the following manner:—A woman was murdered at Slough, and a description of the murderer was telegraphed to London so that the police were enabled to meet and arrest him. The man was Tawell, a Quaker and ticket-of-leave man in business as a chemist at Berkhamsted, so that a Hertfordshire man, though one of whom the county was not inordinately proud, indirectly gave a great impetus to the development of telegraphy. In 1851 the first submarine cable was laid to France.

Greater facilities for travel and communication did much for the development of science and trade, but in order that their full benefit should be felt it was necessary that books should also be

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cheap. In 1800 all printing was done by hand-power, 70 small sheets per hour printed on one side only, being the work of two men. About this period two important methods were successfully introduced, namely, lithography and stereotyping; but with the development of the steam-engine came König's rotary press in 1811, which was soon in use by the 'Times' newspaper, and by 1820 this machine printed from 1,500 to 1,800 sheets per hour on both sides. Hoe's 4-cylinder machine was introduced in 1847, and the number of cylinders was increased until with 10 it was possible to print 12,000 sheets per hour on one side. In 1851 T. Nelson, of Edinburgh, showed a small rotary machine for printing from a reel of paper on both sides; this was taken up in America, and by 1867 the Bullock press printed newspapers automatically from the web at the rate of 10,000 per hour. Hoe in 1871 did 12,000 folded and counted.

At the present time 20,000 copies of the 'Daily Telegraph,' consisting of 8, 10, 12, or 16 pages, are in one hour printed, pasted, folded, and counted in 24s by each of their seven printing machines.

Meanwhile improvements were being made in type-setting. Mitchell in 1854 invented a type-setting machine, but no very great success was made in this direction until 1889, when Mergenthaler devised the Linotype, a machine which produces strips of type properly set up and spaced, and cast in pieces the length of one line of a book or newspaper. This machine is now largely used, and does the work of three compositors. Distribution of type is dispensed with, as the lines of type are re-melted after use. The same is the case with the type produced by the newly-invented Wicks rotary type-casting machines, from which the 'Times' and several other newspapers are now printed. It is more economical to re-melt this type than it is to re-sort it, the enormous rapidity of its production having so greatly reduced the cost.

Electrotyping came into use about 1855, and various methods of making photographic blocks have been introduced since 1880, culminating in the production of coloured pictures by superposing prints in the three (so-called) primary colours from photographic blocks made by light passing through suitably coloured screens.

This great increase of printing could only be possible when paper became plentiful, and a hundred years ago paper had to be made sheet by sheet in moulds. The first paper made in Great Britain was manufactured in 1496 for Wynkyn-de-Worde at Sele Mill, Hertford, by John Tate, and there was little change in paper-making methods between his time and 1804, at which date the first machine

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for making paper in endless webs (the invention of Louis Robert, a Frenchman) was started at Frogmore Mill, Hemel Hempstead, so that our county has a good record in the matter of paper. In 1800 the total quantity of paper made in Great Britain was 8,000 tons, and there were about eighteen paper-mills in this county; at the present time there are in Hertfordshire only five mills, which produce annually about 14,000 tons; in fact, Croxley Mill alone makes more than was made in Great Britain a century ago. The importance of this great increase is obvious when we consider that the consumption of the 'Daily Telegraph' alone is from 35 to 40 tons per day, or about 11,000 tons per annum.

With all these conveniences for transport and communication, and for the publication and dissemination of knowledge, and with steam-power to make every mechanical and engineering process easy or at least practicable, progress in all branches of science has during the last hundred years been unprecedentedly and ever-increasingly rapid, and this acceleration of progress is likely to be continued during the present century. And whereas a hundred years ago it was still possible for one man to know all that was known either in natural history or in physical science, it will in the future be necessary for each scientific man to confine his energies to the mastery and elucidation of some one line of research, and probably to specialize on one small branch of one subject.

The year 1801 found Chemistry still quite in its infancy. The suggestion of Lavoisier had indeed recently discredited the existence of that mysterious combustible part of matter which had been known as "phlogiston," and the new century was marked by the discovery or isolation of various bodies as elements; a few years later the theory of atomic weights for the elements was established by Davy and others, thus completing the foundation on which modern chemistry has been built up. It is, of course, impossible to give in a few words any clear idea of the century's progress in any branch of science, but I wish for a moment to show how much the increasing knowledge of chemistry has done to help the study of other sciences, and to facilitate trade and travel in all parts of the world, by making the production and distribution of light cheap and easy.

In 1801 the flint and steel with the tinder-box was the only method of obtaining a light. In 1805 came sulphur matches tipped with sugar and chlorate of potash, which ignited when dipped in sulphuric acid, not a pleasant liquid to carry in one's pocket. In 1816 Derosne, a Frenchman, made friction-matches to be used with phosphorus carried in a bottle. In 1827 John Walker, of Stockton-on-Tees, introduced lucifer-matches or "Congreves," of which 84

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with a piece of sand-paper were sold for 1*s*. The ordinary match followed in 1833, and the safety-match in 1855. As for lamps, the old cruse form was giving way to the Argand lamp invented in 1784, when, in 1800, Carcel in France introduced a pump-lamp, which in 1836 was superseded by the Moderator; but as late as 1811 the Eddystone Lighthouse was only illuminated by 24 wax candles. Petroleum was not used for lighting until 1855, and its use did not become general until the introduction of the duplex lamp a dozen years later. Coal gas had first been used for lighting a building in 1787 by Lord Dundonald, who used it occasionally for lighting Culross Abbey, and in 1797 Murdock had lit Boulton & Watt's works by it. In 1803 the Lyceum was lit, and in 1810 the Gas Light & Coke Company was started. By 1816 gas was in general use throughout London. Coal gas is still the chief source of artificial light, having found a useful auxiliary in the incandescent mantles introduced of late years, and well known by the name of Welsbach, though their cost and price have yet to be more nearly reconciled. Another comparatively new gaseous illuminant is acetylene gas, which was introduced about five years ago; being easily made from carbide of calcium, and affording a most brilliant light, it may have an equally brilliant future before it.

Another matter in which chemistry has greatly benefited mankind is photography. The effect of light on silver salts had been noticed by Scheele about 1770, and in 1802 Wedgwood succeeded in making photographs with nitrate of silver, but failed to fix them, and it was not until nearly 1830 that J. N. de Niepce made a successful permanent photograph; in 1835 Fox Talbot devised his method of photographing on paper, and this was published in 1839, just before the publication of the Daguerre and Niepce improved method for photographing on silver; in 1850 the use of a film of collodion on glass was introduced by Archer at the suggestion of Le Gray; in 1856 came Norris' dry plates, improved by Sayce & Bolton in 1864; and gelatine dry plates were introduced in 1888. Amongst the many uses of modern photography to science besides the preparation of photographic blocks accurately depicting natural objects, and the production of true magic-lantern slides, mention must be made of stellar photography, by which exact star maps are made and new planets discovered; microphotography for recording the discoveries made by the microscope; and telephotography for showing objects as seen through a telescope. In these days the aid of chemistry is sought by nearly all the industries of the world, and applied chemistry each year occupies a more important position in commerce. At the same time fresh discoveries

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continue to be made and fresh elements discovered, such as argon by Lord Rayleigh in 1894, and helium by Ramsay; and we now know that probably all elements can exist either as gases, liquids, or solids. In 1899 this was demonstrated as regards that very light gas hydrogen, which after having been converted into a liquid was at last frozen solid at a temperature of −267° Centigrade, that is to say, nearly as much colder than ice, as melting lead is hotter. (Lead melts at 320° Cent., and what is known as the absolute zero is −273° Cent.)

The past century has also taught us much about light, heat, and electricity. As regards light, it opened with the discovery of the laws of interference by Young in 1801. Polarization was noticed and explained by Malus in 1810, and about this period the independent investigations of Dr. Wollaston and Fraunhofer called attention to spectrum analysis and the spectroscope, that most important of all aids to the chemist and astronomer, and one with which the names of Kirchhoff, Bunsen, Huggins, and Lockyer are closely connected.

At the beginning of the century the old idea that heat or caloric existed as an actual body always found in matter, was being gradually disproved, "phlogiston" and "caloric" dying hard together. But probably the most important event of the century as regards heat is Joule's determination of its mechanical equivalent, about 1845, a discovery which has been of such vital importance in the development of the steam-engine.

The enormous advance made in electrical knowledge during this period is obvious to everyone. In 1790 Galvani had produced electricity by the contact of metals with fluids, and in 1800 Volta produced it by the contact of different metals; but, when the last century opened, galvanic electricity, frictional electricity, and magnetism were still regarded as independent of each other, and it was not until 1820, after Oersted had shown the connection between electricity and magnetism, that the three were considered to be one. Ampère, Joseph Henry, and Faraday greatly advanced matters, and the latter in 1830 found that a magnet could produce electric currents in wires, and in 1848 showed that polarized light was affected by electricity. Towards the end of the century further great steps in electrical knowledge have been made. Hertz has measured the length of electric waves, and demonstrated that electricity can be reflected, refracted, and polarized. And Maxwell has proved that heat, light, and electricity are essentially one, and differ only in their wave-lengths.

The electric telegraph, which was foreshadowed at the end of

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the eighteenth century, as I have already mentioned, became an accomplished fact about 1847, and has been developing ever since; it is now usual to send many different messages simultaneously over the same wire, and in these days it is even possible to telegraph drawings and written matter. The telephone, originated by Reis, was first used about 1875; and wireless telegraphy, based on Hertz' discovery of the waves produced in ether by electric sparks, was brought to a practical issue by Marconi in 1897, and has now been proved to be workable over a distance of 1,500 miles or more.

The importance of electricity amongst manufacturers has been growing ever since 1840, when electro-plating was introduced, and it has received an immense impetus from the development of the dynamo first introduced by Paccinotti and by Gramme in 1861. For many years past various chemical substances, such as bleaching powder and caustic soda have been produced by electrolysis on a commercial scale in various parts of the world. Steam or water power is now habitually distributed by electricity, and in some cases is conveyed with economy for distances of over 100 miles, and even in this county machinery is largely driven by electricity, and one hears rumours about the advent of electric tramways into some of the towns in our county. In 1849 the electric light was unsuccessfully tried in London, and little use was made of it until 1880, when part of the Thames Embankment was lit by it; since then both arc and incandescent lamps have come more and more into use all over the world, and bid fair to displace most other illuminants both in Watford and elsewhere, whilst at the same time electricity itself is clearly destined year by year to take a more intimate and important part in all the doings of mankind, both domestic and commercial.

The strides made in Astronomy during the past hundred years have been enormous, thanks to the improvements made in telescopes and other instruments and to the invention of the spectroscope and photography.

The discovery of new planets or asteroids during the century commenced with that of Ceres by Piazzi in 1801 and of Pallas by Olbers in 1802, and in 1868 there were about 100 known to astronomers. At the present time the orbits of nearly 500 have been ascertained. Of all these discoveries the most noteworthy, from a scientific point of view, was that of Neptune in 1846. Astronomers had for years noticed irregularities in the orbit of Uranus, and M. Leverrier and Mr. Adams set to work independently to discover mathematically the values of the elements of the orbit

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of an imaginary planet that might cause these irregularities; their results, which were practically identical, were communicated to Dr. Galle at Berlin on September 23rd, and the same evening he discovered Neptune in the spot indicated.

In the first half of the century it was discovered that the periods of comets got altered by their passing near planets; in the next quarter that shooting stars are portions separated from a comet, which come into the earth's atmosphere. And during the last quarter, and especially during the last few years, much has been discovered by means of the spectroscope, not only as regards the chemical elements to be found in the stars, but also as regards their motion through space. At the Lick Observatory, with its excellent instruments and favourable atmosphere, it has been proved by the spectroscope that about one star in each dozen is a binary system, that is to say, it has at least one planet revolving round it, a planet which is in itself absolutely invisible to us by any known instrument. Yet the marvellous accuracy and sensitiveness of modern scientific instruments is such that astronomers seem able to investigate anything that enters their mind. For instance, a Chicago astronomer has calculated that the heat given out by the star Vega is equal to that radiated by a candle at a distance of 8 miles. Possibly we may feel that this discovery, like that of the Nova Persei, and indeed of all other astronomical discoveries, is of very little practical value; and some may even doubt whether we shall learn much by any message from Mars—when we get it—and I will therefore say no more on this subject, but pass at once to the last branch of knowledge to which I shall refer, and one to which we are all more or less indebted for help in the past. I mean the science of Medicine.

Undoubtedly more progress has been made in medicine during the past century than had been made in the previous two thousand years, thanks not only to the improvements made in microscopes and other scientific instruments, but also to the greatly-increased knowledge of physics and chemistry, and especially to the adoption of scientific methods of investigation. The following are some of the more important advances of medicine.

Vaccination was introduced instead of inoculation for smallpox between 1790 and 1801. The stethoscope was introduced about 1815–25. Of anæsthetics, nitrous oxide, the properties of which were discovered by Sir H. Davy in 1800, was first used by dentists in America in 1844, and Dr. Morton in the same country began using sulphuric ether in 1846, in which year it was also used in England, chloroform following in 1847. Cocaine is a much more recent

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invention. About 30 years ago the clinical thermometer was gradually coming into use; and during the last quarter of a century, thanks in a great measure to the teaching of Lord Lister and the study of bacteriology, antiseptic and aseptic treatment has wonderfully modified medical practice. It now seems almost impossible to believe that our ancestors managed to live and die without ever having heard of microbes, bacilli, microzoa, etc., and that it is only during the last twenty years that such diseases as cholera, the plague, diphtheria, influenza, tuberculosis, typhoid, tetanus, erysipelas, pyæmia, etc., have been clearly traced to the presence of those minute vegetable organisms called bacteria, with the result that so many of them are already being successfully met by antitoxin treatment, a treatment which is, I believe, based on the old-time method of setting a thief to catch a thief. The most picturesque application of modern science to medicine has, no doubt, been the introduction since 1895 of the Röntgen Rays to surgery, by which very many valuable lives will be saved annually, especially in times of war.

The time at my disposal will not admit of any review of the engineering triumphs of the century, nor of the progress made in hosts of other directions, as for instance in Natural History; but as the mechanical ingenuity of the age to which we are indebted for such labour-saving appliances as the sewing-machine, type-writer, and more recent piano-player, seems likely soon to do everything for us mechanically, and will probably accept payment on a-penny-in-the-slot basis, we will hope that those who come hereafter will have ample leisure in which to build up a fuller knowledge of science on the firm foundation that has been so laboriously prepared for them during the past hundred years.

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XIII.

NOTES ON THE FISH OF THE UPPER LEA.

By James Saunders, A.L.S.

Read at Watford, 25th March, 1902.

The following lists of fishes which have been observed in the upper part of the River Lea, and in its expansion the lake in Luton Hoo Park, may be of interest for comparison with a list of those which have been observed in the lower part of the same river in the county of Hertford.* The records from the Lea north of Luton are from original observation of species seen in that river prior to a drought which occurred in the Summer of the year 1868,† while those from Luton Hoo southwards to the confines of the county of Bedford are from information furnished by the fishkeeper on the Luton Hoo estate, and also from a personal inspection of the mounted specimens of fish in the small museum at the boat-house by the Luton Hoo lake.

The largest of the pike there preserved measures about 45 inches in length, and when caught turned the scale at 38 pounds. The voracity of this species is proverbial, and may be illustrated by the following incidents. One morning during the early part of the Summer of 1900, the fishkeeper, when engaged in removing some dead fish near the waterfall, noticed that a large pike, which was partly decomposed, had partially swallowed a rat, its tail only projecting from the mouth of the fish. The keeper supposed that the throat of the pike was sufficiently capacious to swallow the rat, but that the prey had mortally injured its enemy before it was suffocated. During the shooting-season of the same year a young pheasant was wounded and fell into the lake, when it at once disappeared and was never seen again, evidently having been captured by a pike. And in July, 1901, the keeper witnessed the disappearance of a half-grown bald coot as a brood of these birds attempted to swim across a rather narrow part of the lake. The coot had been arrested in its course by a pike.

During the drought referred to above, the River Lea dried up north of the Luton Hoo lake, an event of which there is no previous local record. I remember how the fish crowded into the gradually-diminishing pools of the deepest parts of the river-bed, until eventually they all died from the entire absence of water. The only fish which I have observed to have re-established themselves are the sticklebacks, and these have a hard struggle to maintain an existence owing to the diminished rainfall of recent years.

* See paper on "Izaak Walton and the River Lea," by R. B. Croft: 'Trans. Herts Nat. Hist. Soc.,' vol. ii, p. 9.

† The mean rainfall at eight stations in Hertfordshire in June, 1868, was 0·47 in., and in July, 0·36 in. It is very exceptional to have two consecutive Summer months with only about half an inch of rain in each.—Ed.

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Species observed in the River Lea below Luton Hoo:

Bullhead (*Cottus gobio*, L.).	Loach (*Nemachilus barbatulus*, L.).
Roach (*Leuciscus rutilus*, L.).	Pike (*Esox lucius*, L.).*
Dace (*L. vulgaris*, Flem.).	Trout (*Salmo fario*, L.).†
Minnow (*L. phoxinus*, L.).	Lamprey(*Petromyzon fluviatilis*,L.).

Species observed in Luton Hoo Lake:

Perch (*Perca fluviatilis*, L.).	Pike (*Esox lucius*, L.).
Roach (*Leuciscus rutilus*, L.).	Trout (*Salmo fario*, L.).
Rudd (*L. erythrophthalmus*, L.).	Eel (*Anguilla vulgaris*, Flem.).
Tench (*Tinca vulgaris*, Cuv.).	Lamprey(*Petromyzon fluviatilis*,L.).

Species observed in the River Lea north of Luton:

Bullhead (*Cottus gobio*, L.).	Dace (*Leuciscus vulgaris*, Flem.).
Three-spined Stickleback	Minnow (*L. phoxinus*, L.).
(*Gastrosteus aculeatus*, L.).	Loach (*Nemachilus barbatulus*, L.).
Ten-spined (*G. pungitius*, L.).	Lamprey(*Petromyzon fluviatilis*,L.).

During the latter part of the Summer of 1894 a great mortality befel the fish of Luton Hoo lake, especially the pike, which are always numerous and often attain a large size. This appears to have been mainly due to the ravages of the fungus *Saprolegnia ferax*, which also attacked other fish, but was strangely fatal to the pike. I remember seeing in the lake many perch which showed signs of the disease caused by this fungus, as well as numerous large pike floating dead on the surface. Although this disease was the proximate cause of the destruction of the fish, the pollution of the water by the sewage from Luton undoubtedly rendered them unhealthy and thus particularly susceptible to its attacks.

By the courtesy of the fishkeeper, Mr. Groom, I have been permitted to examine the records kept at Luton Hoo which refer to this matter, and I find that, between the 27th of August and the 10th of September, 395 dead pike were taken from the lake, the greatest number in any one day being 85 on Sept. 1st. Samples of the water for analysis were taken on Sept. 7th and 11th, and as the result of representations made to the authorities of Luton an improved system of sewage-disposal was carried out, and there has been no recurrence of a similar mortality. In the boat-house at Luton Hoo there is a photograph of several pike which were taken from the lake during the period referred to, and from the gruesome spectacle which they present there is no wonder that the lord of the manor sought a remedy.

* Occasionally. † Introduced.

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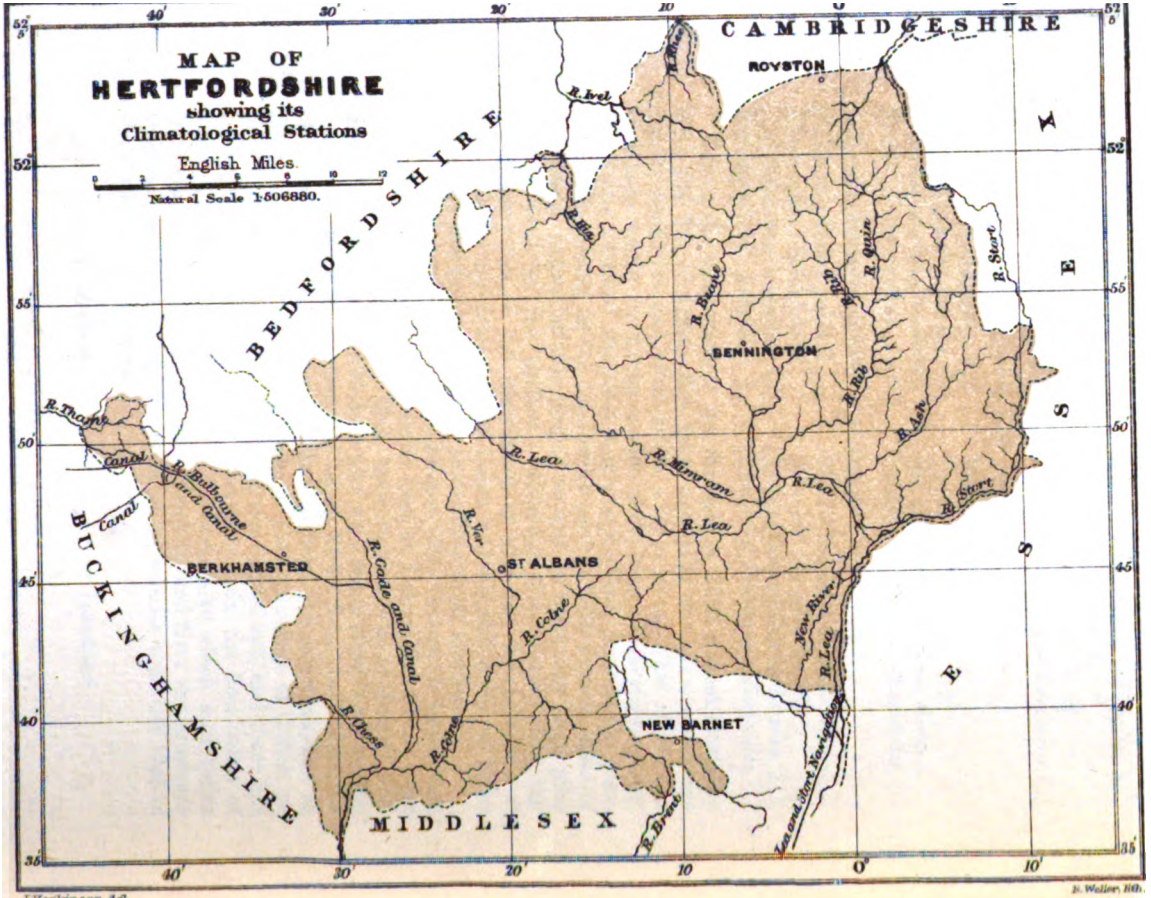
MAP OF
HERTFORDSHIRE
showing its
Climatological Stations
English Miles.
Natural Scale 1:506880.
CAMBRIDGESHIRE
ROYSTON
BEDFORDSHIRE
BENNINGTON
BERKHAMSTED
ST ALBANS
NEW BARNET
BUCKINGHAMSHIRE
MIDDLESEX
ESSEX
R. Ivel
R. Rhee
R. Beane
R. Quin
R. Stort
R. Lea
R. Mimram
R. Ver
R. Colne
R. Gade and Canal
R. Chess
R. Brent
R. Thame
Canal
R. Bulbourne and Canal
New River
Lea and Stort Navigation
J. Hopkinson, del.
E. Weller, lith.

XIV.

THE CLIMATE OF HERTFORDSHIRE, DEDUCED FROM METEOROLOGICAL OBSERVATIONS TAKEN DURING THE TWELVE YEARS 1887–1898.

By John Hopkinson, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

Read at Watford, 25th March, 1902.

PLATE VII.

Climate has been defined by Dr. H. R. Mill as "the normal or average condition of meteorological phenomena at a given place," or in other words "the average weather of a place," the former being its theoretical and the latter its practical aspect.* By an inspection of maps in a meteorological atlas such as that issued by the Meteorological Council,† or the fine 'Atlas of Meteorology' edited by Dr. Buchan,‡ a general idea may be gained of the two chief elements of climate—temperature and rainfall,—in the former work for any part of the British Isles, and in the latter for any part of the world. From this work, the only atlas which gives the *monthly rainfall*, it appears that the mean annual temperature of that part of England in which Hertfordshire is situated, if reduced to sea-level (that is, the theoretical mean for its latitude and position with regard to the sea-coast of England), would be 50° or a little above it, but that the actual mean varies from 46°–48° on the Chiltern Hills in the north-west to 48°–50° in the rest and much the greater part of the county; also that the mean annual rainfall is between 25 and 30 inches, the larger amount being approached in the vicinity of the Chilterns only.

In ascertaining from an atlas the average temperature and rainfall, which are the only climatic elements usually given, we have the advantage of easy comparison with the same elements of the climate of other parts of the British Islands, of Europe, or of the world; but climate is too complex a phenomenon for any definite idea of the average weather of Hertfordshire (its practical aspect) to be thus formed. Not only have we to consider the temperature, rainfall, humidity of the air, amount of cloud and sunshine, and the force and direction of the wind, but also the elevation of the surface, the nature of the soil, the extent of water, of woods, of barren heaths and cultivated land, and the presence or absence of manufacturing towns or districts.

Hertfordshire is hilly, though not mountainous, a great extent of its surface being at a considerable elevation above sea-level, especially towards the north-west, the general inclination being south-easterly; it has a dry soil, is well watered with numerous

* "Climate and the Effects of Climate": 'Quart. Journ. Royal Meteorol. Soc.,' vol. xxvii, p. 172. 1901.

† 'Meteorological Atlas of the British Isles.' 4to. 1883.

‡ Bartholomew's 'Physical Atlas,' vol. iii. Folio. 1899.

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rivers of clear water chiefly derived from springs in the Chalk, and is well but not too densely wooded. It has also many fine parks and country seats, a fair proportion of uncultivated land forming gorse-covered commons, and many of its main roads and country lanes have wide strips of grass-covered roadside wastes. Its atmosphere is not contaminated by factories, there being no industry in the county which interferes to any appreciable extent with the purity of the air, and the only manufacturing processes by which the rivers are contaminated are those of paper-making and (to a very small extent) of gas-manufacturing. It thus maintains the reputation for salubrity which it gained more than three centuries ago, when our earliest county historian, Norden, said: "The ayre for the most part is very salutarie, and in regard thereof many sweete and pleasant dwellinges, healthfull by nature and profitable by arte and industrie, are planted there."* Sixty-five years later Fuller remarked: "It is the garden of England for delight, and men commonly say that such who buy a house in Hartfordshire pay two years' purchase for the aire thereof." † And nearly forty years later still Chauncy said: "The Air is clear, sweet, and very wholesome, which probably in old time might invite several Saxon Kings to reside often, keep their Courts, and hold their Parliamentary Councils in this County; and divers Kings since the time of the Conquest, to breed and educate their Children here; as also the Physicians in London to recommend their Patients hither, in hopes that when Physick fails, the Air may effect the Cure; and many of the Nobility and Gentry to build stately Pallaces and Fabricks, pleasant Dwellings and delicious Seats in this County, . . ." ‡

Of the various factors which contribute to the salubrity of our county, that of most importance is its geological structure.

The influence of soils and sub-soils upon the stratum of air which we breathe is very great, and the healthy dry air of Hertfordshire is due to the absorbent sub-soil which predominates owing to the Chalk forming the foundation of the county. If in place of this formation we had older rocks replete with mineral wealth, the air would not now be "clear, sweet, and very wholesome," to use the words of Chauncy, for it would be contaminated by smoke and deleterious fumes or vapours; and if, on the other hand, the London Clay had not been removed by erosion from very much the greater part of the county, "Physicians in London" in olden times would not have had so much reason "to recommend their Patients hither," for the air, though probably sweeter, would not have been any drier than it was in London. And it is to geologic agencies that we owe the elevation of the ground, which averages at least 300 feet above sea-level, and reaches to upwards of 800 feet, this considerable elevation being a potent factor in the "salutarie" nature of the "aire," as is recognized in the present day far more than it was when Norden wrote.

* 'The Description of Hartfordshire,' p. 2. 1597.
† 'The Worthies of England,' part 2, p. 17. 1662.
‡ 'The Historical Antiquities of Hertfordshire,' p. 6. 1700.

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Whether the Chalk comes to the surface or not, it forms the groundwork or foundation of the whole of Hertfordshire except a very small portion of the county beyond its escarpment on the north-west, where the Gault Clay crops out from underneath it, with here and there a thin bed of the Upper Greensand forming a porous layer between this clay and the Chalk Marl. This is the least permeable of any division of the Chalk, its highest division, the Upper Chalk or "Chalk-with-flints," which occupies very much the largest area in the county, being the most permeable. In the south-east the Chalk is overlain by a stratum of the Reading Beds, not exceeding 30 feet in thickness and of a mixed nature and very variable character, partly pervious and partly impervious, which is covered, except along its usually narrow outcrop, by the impervious London Clay. Leaving out of consideration the small area of Gault Clay and Upper Greensand, the Reading Beds form the dividing band between the calcareous rock on the north-west, which so freely absorbs moisture that all the rain which falls upon it almost immediately sinks into it, and the argillaceous on the south-east, which absorbs it so slowly that the rain remains for a long time upon its surface, or some portion flows off it. In the one case we have a soil which absorbs moisture from the air, and in the other, one which may sometimes impart moisture to it.

The line of division between these two kinds of soil is very irregular, but it has a general north-east and south-west trend, following, at a distance varying from a quarter of a mile to a mile and a half, the River Ash downwards from Furneaux Pelham to Amwell Magna, the River Lea upwards from Hoddesdon to Hatfield, and the River Colne downwards from North Mimms to Harefield.

But neither the Chalk on the north-west of this line nor the London Clay on the south-east of it everywhere comes to the surface. It is only in the north of the county and in the valleys that the Chalk does so extensively. In the north it forms open downs, with a thin soil and scanty herbage on its steep escarpment; near its south-eastern margin there is upon it a line of outliers of the Reading Beds, on some of which there is London Clay; and in the rest of the county, except in the higher valleys, it is mostly covered by superficial deposits, partly pervious, such as Glacial gravel and sand, and river-gravels, and partly impervious, such as clay-with-flints and boulder-clay. The former is a bed, usually thin but of varying thickness, formed by the continuous decomposition of the surface of the Upper Chalk and not affecting its permeability to any appreciable extent, and the latter is a Glacial deposit only here and there of any considerable thickness; but where it does occur, which is chiefly in the east of the county, it sometimes makes the soil more moist and the atmosphere more humid.

The surface of the clay area is modified to some extent, on the higher hills only, by beds of gravel and sand of Glacial and Post-glacial age, but these are nowhere of any great thickness. Their presence is often shown by the water which percolates through them oozing out around their margins, where it is held up by the clay.

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Throughout all the chalk area the rivers have cut their way through the superficial deposits, so that whatever may be the nature of the soil upon the hills, that on their flanks, as far down as the alluvial plains, is dry. In the valley of the Lea such a plain extends downwards from Hertford, and in the valley of the Colne from about a mile above Watford, where for a short distance it is lower than the present bed of the river. Both these plains are frequently flooded, thus increasing the moisture of the air above them, and even in dry weather, early in the morning or late in the evening, a thin stratum of ground-fog may sometimes be seen resting upon them while the air above the higher ground is perfectly clear. Over the greater part of the county, also, there are dry valleys in the Chalk down which rivers flowed when its plane of saturation was at a higher level than it is now, or at a more remote period when the London Clay extended farther over the Chalk; they are cut into the Chalk, thus affording a permanent record of the former existence of many more streams than we now possess,—streams which, where they have flowed over clayey lands, have by their erosive action extended the area of bare chalk, and have thus contributed to the present dryness of the soil.

On the whole, therefore, the division of the county, along the line indicated above, into two very unequal portions, a large north-western area with a dry soil and atmosphere, and a small south-eastern area with a comparatively moist soil and atmosphere, is a sufficiently accurate climatic division.

Under the title of "Climatological Observations taken in Hertfordshire," and subsequently, when other observations were added, of "Meteorological Observations taken in Hertfordshire," there have been published annually in our 'Transactions' some of the results of observations taken at five meteorological stations in the county during the twelve years 1887 to 1898. It is believed that this period is a sufficiently long one, and that the stations are sufficiently numerous and widely-distributed, for the results of these observations to be of value in enabling a knowledge of the climate of the county to be arrived at, except for one element of climate, and that is rainfall.

To arrive at the average rainfall over an area of 630 square miles, and to form an idea of the extreme falls, five stations are inadequate, and the period of twelve years is much too short. Although, therefore, the rainfall is tabulated from these observations, and the mean monthly fall for the 60 years 1840 to 1899 is given, reference should be made for full information on this subject to the "Reports on the Rainfall in Hertfordshire" which have appeared annually in our 'Transactions' for the last twenty-five years, and also to the author's papers on "Half-a-Century's Rainfall in Hertfordshire," * and on "Hertfordshire Rainfall, Percolation, and Evaporation." †

* 'Trans. Herts Nat. Hist. Soc.,' vol. vi, pp. 81–88.
† *Ib.*, vol. ix, pp. 33–72.

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The five meteorological stations are Royston, Berkhamsted, St. Albans, Bennington, and New Barnet. They are now reduced to four owing to the Royston station having been discontinued in 1899. Observations have been taken with verified instruments and in an uniform manner at all these stations, but the exposure of the thermometers for ascertaining the temperature of the air in the shade is not uniform. At Berkhamsted, St. Albans, and Bennington they are in Stevenson louvre-boarded screens, in accordance with the regulations of the Royal Meteorological Society; at Royston and New Barnet under Glaisher open stands, as at most of the stations contributing to the "Meteorology of England" in the 'Quarterly Reports' of the Registrar-General.

The Stevenson screen affords a complete protection from the effects of radiation by which the thermometers under the Glaisher stand are cooled below the temperature of the air at night, and of reflection by which those under a Glaisher stand are heated above the temperature of the air on sunshiny days. While, therefore, the observations at Berkhamsted, St. Albans, and Bennington are strictly comparable, the greater range of temperature shown at Royston, and the still greater at New Barnet, are features due rather to the difference in the exposure of the thermometers than to any actual excess in the range at these two places. From experiments which have been made between these two methods of exposure it appears that it is only in the range of temperature that they give results which are widely divergent, the determination of the mean temperature not being greatly affected.

The "Climatological Observations" which have been published annually in our 'Transactions' are not nearly all those which have been taken at these five stations. Others taken at St. Albans from 1887 to 1896 have been published annually, and a summary has been given in a paper on "The Climate of St. Albans."* No further reference need, therefore, be made to these, but the means of some other observations taken at our two most completely equipped meteorological observatories, Berkhamsted and Bennington, which have only appeared in our 'Transactions' from the year 1897, have been computed for the twelve years from the 'Meteorological Record' of the Royal Meteorological Society.

All the observations which have been utilized in this communication are taken at 9 a.m., but the barometrical observations at Berkhamsted and Bennington are also taken at 9 p.m., and the average at both hours is that here given. All are entered to the day of observation except the maximum temperature and the rainfall, which are entered to the previous day. All the thermometers are four feet above the ground and over grass.

The position and altitude of the various stations, with the names of the observers, are given in the headings to the tables. A few further particulars follow.†

Royston (*London Road*).—Rain-gauge 8 inches in diameter, rim

* 'Trans. Herts Nat. Hist. Soc.,' vol. ix, pp. 215–228.

† See also vol. v, pp. 203–204.

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1 foot above the ground. Thermometer-stand on the east side of, and not far from, the house, the ground sloping slightly down towards the south-east. Sub-soil, chalk. Exposure of the instruments sufficiently open. The observations were discontinued on the death of the observer early in the year 1899.

Berkhamsted (*Rosebank*).—Rain-gauge 8 inches in diameter, rim 1 foot above the ground. Sunshine-recorder, Campbell-Stokes. Thermometers, rain-gauges, and other instruments, some distance from the house, on a level plot of ground set apart for them, the general slope of the ground being rather steep towards the south-east. Sub-soil, clay-with-flints on chalk. Exposure perfectly open. There are numerous meteorological instruments the records of which are not given here, including several which are self-recording, and two percolation-gauges, this being one of the most perfectly equipped meteorological observatories in this country.

St. Albans (*The Grange*).—Rain-gauge 5 inches in diameter, rim 1 foot above the ground. Full particulars of this station, a very open one, have been given in our 'Transactions,' in the paper on "The Climate of St. Albans" previously referred to. The observations were discontinued here early in the year 1900 owing to the removal of the observer from St. Albans to Watford. They are continued with the same instruments at the Hertfordshire County Museum, St. Albans. The stations are very near to each other, and at both the sub-soil is gravel on chalk.

Bennington (*Bennington House*).—Rain-gauge 5 inches in diameter, rim 1 foot above the ground. Sunshine-recorder, Jordan photographic. The instruments are a considerable distance from the house, and in a very exposed situation on nearly level ground overlooking a great extent of country on the north and east. The situation is a very fine one, and admirably adapted for showing what is the climate of the Chalk hills of the north of the county. As at Berkhamsted there are numerous meteorological instruments besides those of which the records are here given.

New Barnet (*Gas Works*).—Rain-gauge 8 inches in diameter, rim 1 foot above the ground. The instruments are in a rather low position near the office of the Barnet Gas Company, but a sufficient distance from it and from any other building. The situation appears to be rather damp and confined. Although it is not an ideal one for the purpose, it well represents the London Clay district on the north of London, and it is the only Hertfordshire meteorological station which is not on the Chalk.

There is not a county in England which is better supplied. for its area, with meteorological observatories than is Hertfordshire, notwithstanding the discontinuance of the Royston station, and the stations, as will be seen from the accompanying map (Plate VII), are wide apart, and they represent hill and valley, and chalky, gravelly, and clayey soils.

The following table gives the annual means, with extremes of temperature, at these stations for the twelve years 1887 to 1898. It will be seen that both the mean, and the mean minimum

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and maximum temperatures, very closely agree at Berkhamsted,* St. Albans, and Bennington, but that the mean minimum (or night) temperature at New Barnet is considerably lower than it is at any of the other four places, and also that the mean maximum (or day) temperature at Royston and New Barnet is considerably higher than it is at any of the other three places. The low mean minimum temperature at New Barnet is probably due in part to the kind of stand used, and in part to the nature of the sub-soil, London Clay, which retains moisture and induces ground-fogs by which the air is rendered colder at night than it would be in a higher position and on a drier stratum. The high maximum temperature at Royston and New Barnet is fully accounted for by the Glaisher stand being used at these two stations. The mean minimum at Royston is unaccountably high, taking into consideration the kind of stand used there, and it is remarkable that this, the most northern station, should have the highest *mean* temperature. The only other point in this table calling for remark is the small number of days of rain at New Barnet, which is owing to the omission of slight falls of rain and snow; but this does not sensibly affect the amount registered, for the water, except perhaps a very small quantity which may evaporate, remains in the gauge until measured with the next fall.

RESULTS OF CLIMATOLOGICAL OBSERVATIONS FOR EACH STATION, 1887–1898.

Stations	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Royston	49·0	40·8	57·2	16·4	3·5	93·0	83	6·3	22·21	161
Berkhamsted	48·0	40·3	55·8	15·5	7·5	91·0	82	7·2	25·60	176
St. Albans	48·3	41·1	55·4	14·3	10·1	91·0	82	6·7	26·00	181
Bennington	48·0	40·7	55·3	14·6	9·7	90·9	81	7·3	23·89	182
New Barnet	48·2	38·8	57·6	18·8	1·0	94·5	83	6·2	23·64	139
County	48·3	40·4	56·3	15·9	1·0	94·5	82	6·7	24·27	168

The next table gives the results for the seasons, the year being divided as usual. It will be seen that Autumn is warmer than Spring chiefly on account of the colder nights in Spring, and that although the range of temperature is very much greater in the warmest season than it is in the coldest, it is greater in Spring than it is in Autumn. The relative humidity follows the same rule, the warmest season having the driest atmosphere, but the air in Spring being much drier than it is in Autumn. While Winter and Spring have about the same rainfall, there are much fewer

* The actual mean temperature here is 48°·05.

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wet days in Spring. Winter is by far the most cloudy season, although in these twelve years it has had much less rain than either Summer or Autumn; but this period is very much too short for any conclusions as to rainfall to be founded upon it. Autumn has lately been a much wetter season than it usually is, owing to heavy rain in October and November.

RESULTS OF CLIMATOLOGICAL OBSERVATIONS FOR EACH SEASON (*Means for the County, with Extremes of Temperature*), 1887–1898.

Seasons	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes					
	Mean	Min.	Max.	Range	Min.	Max.			Amount	Days
	°	°	°	°	°	°	%		ins.	
Spring	46·6	37·5	55·7	18·2	9·0	86·6	79	6·5	5·03	39
Summer	60·2	50·4	70·0	19·6	29·0	94·5	75	6·6	6·94	40
Autumn	49·2	41·8	56·6	14·8	15·0	91·8	86	6·6	7·26	45
Winter	37·2	31·7	42·7	11·0	1·0	65·3	89	7·2	5·04	44

The monthly results follow, first for the County and then for each station. The mean temperature is seen to increase very little from January to February, but then with gradually increasing rapidity to June; it remains nearly stationary to August, decreases at about the average rate per month to September, then at twice the average rate to October, and at a little above the average to December. If we assume that the middle of each month has about the average temperature of the month, the rate of increase and decrease given above will give approximately the rate from the middle of one month to that of another. Although the range of temperature generally increases as the weather becomes warmer, and *vice versâ*, the warmest month has not the greatest mean daily range, for this increases more rapidly than the temperature, and reaches its maximum in June. The greatest absolute range of temperature is in September and the next in May, the former chiefly owing to warm days and the latter to cold nights. The air is as a rule driest in the warmest months, but the mid-vernal month, April, although much colder than the mid-autumnal month, October, has as much as 9 per cent. less relative humidity. A remarkable feature of the rainfall of these twelve years is that it has been 50 per cent. greater on the average in the last half of the year than in the first half. There have been falls during this period of at least 2½ ins. in twenty-four hours on twelve occasions. On the 12th of July, 1889, such a fall occurred at 18 stations out of 30 then recording, and at least 3½ ins. at 4 of these. Falls of at least 3 ins. have occurred on seven occasions, and of at least 3½ ins. on 12th July, 1889, the day with the greatest average rainfall in the county, and on 17th July, 1890, the day with the greatest fall at any one station, viz., 4·19 ins. at Moor Park, Rickmansworth.

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HERTFORDSHIRE.

Means of Climatological Observations, with Extremes of Temperature, at Royston, Berkhamsted, St. Albans, Bennington, and New Barnet.

1887–98	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·1	31·1	41·1	10·0	4·0	59·8	90	7·5	1·62	16
Feb.	37·7	31·5	43·8	12·3	1·0	65·3	87	7·0	1·31	12
March	41·2	33·4	49·0	15·6	9·0	68·0	83	6·7	1·96	15
April	46·2	36·7	55·7	19·0	17·8	82·9	78	6·5	1·30	12
May	52·3	42·4	62·2	19·8	21·0	86·6	75	6·3	1·77	12
June	59·0	48·8	69·3	20·5	29·0	90·0	75	6·6	1·72	11
July	61·0	51·3	70·8	19·5	34·0	90·3	74	6·7	2·54	14
August	60·6	51·1	70·0	18·9	33·1	94·5	76	6·4	2·68	15
Sept.	56·6	47·6	65·7	18·1	25·8	91·8	82	6·0	1·90	12
Oct.	48·0	40·6	55·4	14·8	16·0	74·3	87	6·4	2·87	17
Nov.	43·0	37·3	48·7	11·4	15·0	64·0	90	7·5	2·49	16
Dec.	37·9	32·5	43·2	10·7	4·3	59·0	90	7·1	2·11	16
Year	48·3	40·4	56·3	15·9	1·0	94·5	82	6·7	24·27	168

ROYSTON.

(London Road.)

Latitude: 52° 2′ 34″ N. Longitude: 0° 1′ 8″ W. Altitude: 301 feet.

Observer: *Hale Wortham, F.R.Met. Soc.*

1887–98	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·1	31·3	40·9	9·6	10·0	54·9	88	7·0	1·40	16
Feb.	37·9	31·7	44·1	12·4	3·5	63·4	85	6·6	1·24	11
March	41·8	33·7	49·9	16·2	15·3	68·0	83	6·3	1·79	14
April	47·1	37·0	57·2	20·2	17·8	82·9	80	5·7	1·14	11
May	53·4	42·9	63·9	21·0	27·6	85·9	77	6·0	1·70	12
June	60·5	49·5	71·6	22·1	31·8	88·0	79	6·3	1·68	11
July	62·2	51·7	72·6	20·9	38·0	90·3	79	6·4	2·43	12
August	61·7	51·6	71·8	20·2	38·3	93·0	79	6·1	2·56	14
Sept.	57·3	48·4	66·3	17·9	32·3	89·0	80	5·5	1·80	12
Oct.	48·5	41·3	55·7	14·4	25·4	73·7	86	6·1	2·60	17
Nov.	43·8	37·8	48·9	11·1	15·2	63·1	90	7·2	2·10	15
Dec.	38·0	32·7	43·2	10·5	4·3	59·0	88	6·9	1·77	16
Year	49·0	40·8	57·2	16·4	3·5	93·0	83	6·3	22·21	161

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BERKHAMSTED.

(Rosebank.)

Latitude: 51° 45′ 40″ N. Longitude: 0° 33′ 30″ W. Altitude: 400 feet.

Observer: *Edward Mawley, V.P.R.Met. Soc.*

1887–98	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·1	31·2	41·1	9·9	10·8	56·8	93	8·0	1·88	17
Feb.	37·7	31·7	43·6	11·9	7·5	64·1	89	7·6	1·46	12
March	41·1	33·6	48·6	15·0	13·8	66·8	83	7·0	2·14	16
April	45·9	36·7	55·1	18·4	22·7	78·7	76	6·9	1·49	13
May	51·8	42·3	61·4	19·1	26·2	82·9	71	6·5	1·66	12
June	58·4	48·5	68·2	19·7	33·1	87·5	73	6·9	1·63	11
July	60·4	51·1	69·8	18·7	39·1	85·5	72	7·1	2·37	15
August	60·0	50·9	69·1	18·2	36·9	91·0	75	6·7	2·71	16
Sept.	56·4	47·4	65·3	17·9	30·3	90·3	80	6·6	1·87	12
Oct.	47·7	40·3	55·2	14·9	23·2	71·8	88	6·9	3·14	18
Nov.	43·0	37·3	48·7	11·4	16·8	62·3	92	8·2	2·86	16
Dec.	38·0	32·8	43·2	10·4	11·1	57·1	92	7·8	2·39	18
Year	48·0	40·3	55·8	15·5	7·5	91·0	82	7·2	25·60	176

ST. ALBANS.

(The Grange.)

Latitude: 51° 45′ 9″ N. Longitude: 0° 20′ 7″ W. Altitude: 380 feet.

Observer: *John Hopkinson, F.R.Met. Soc.*

1887–98	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·2	31·3	41·2	9·9	10·9	57·6	91	7·8	1·76	18
Feb.	37·7	32·0	43·4	11·4	10·1	65·3	87	7·0	1·32	13
March	41·2	34·3	48·1	13·8	15·8	66·5	84	6·6	2·14	16
April	46·3	37·8	54·7	16·9	26·3	77·7	77	6·6	1·37	14
May	52·2	43·4	61·0	17·6	29·1	82·3	74	6·3	1·91	13
June	58·8	49·8	67·8	18·0	34·8	86·1	75	6·4	1·86	11
July	60·7	52·2	69·2	17·0	40·6	86·0	73	6·5	2·76	15
August	60·4	52·1	68·6	16·5	42·4	91·0	77	6·3	2·77	16
Sept.	56·7	48·7	64·7	16·0	35·3	89·2	82	6·3	2·04	13
Oct.	47·9	41·3	54·6	13·3	26·2	72·0	88	6·4	3·07	17
Nov.	43·0	37·6	48·4	10·8	18·6	62·5	91	7·4	2·74	17
Dec.	38·0	32·7	43·3	10·6	11·8	57·8	90	6·9	2·26	18
Year	48·3	41·1	55·4	14·3	10·1	91·0	82	6·7	26·00	181

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BENNINGTON.

(Bennington House.)

Latitude: 51° 53′ 45″ N. Longitude: 0° 5′ 20″ W. Altitude: 407 feet.

Observer: *Rev. J. D. Parker, LL.D., F.R.Met. Soc.*

1887–98	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·0	31·4	40·6	9·2	10·7	59·3	91	7·9	1·51	17
Feb.	37·2	31·8	43·1	11·3	9·7	64·2	87	7·5	1·26	14
March	40·5	33·9	48·1	14·2	17·2	64·4	83	7·3	1·88	16
April	45·9	37·3	54·5	17·2	26·2	78·6	76	7·2	1·31	13
May	51·7	42·6	60·8	18·2	29·0	81·3	72	7·0	1·93	13
June	58·4	48 9	67·9	19·0	35·2	87·1	73	7·3	1·72	12
July	60·7	51·5	69·8	18·3	40·6	85·9	71	7·3	2·67	15
August	60·2	51·5	68 9	17·4	39·0	90·9	74	6·9	2·59	16
Sept.	56·5	48·3	64·7	16·4	34·9	89·4	78	6·7	1·93	13
Oct.	47·9	41·2	54·7	13·5	25·9	72·2	86	7·0	2·76	18
Nov.	42·8	37·6	48·0	10·4	17·2	62·8	91	8·1	2·36	17
Dec.	37·9	33·0	42·8	9·8	14·4	56·4	90	7·4	1·97	18
Year	48·0	40·7	55·3	14·6	9·7	90·9	81	7·3	23·89	182

NEW BARNET.

(Gas Works.)

Latitude: 51° 39′ 5″ N. Longitude: 0° 10′ 15″ W. Altitude: 212 feet.

Observer: *T. H. Martin, M. Inst. C.E.*

1887–98	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·0	30·2	41·9	11·7	4·0	59·8	89	7·0	1·54	12
Feb.	37·6	30·4	44·8	14·4	1·0	63·6	87	6·6	1·27	10
March	40·9	31·7	50·1	18·4	9·0	68·0	84	6·3	1·84	12
April	45·8	34·7	56·9	22·2	17·8	78·8	80	6·1	1·22	11
May	52·3	40·7	63·9	23·2	21·0	86·8	78	5·8	1·64	10
June	59·1	47·2	70·9	23·7	29·0	90·0	78	6·1	1·72	9
July	61·2	49·9	72·6	22·7	34·0	89·5	75	5·9	2·47	12
August	60·5	49·3	71·8	22·5	33·1	94·5	75	5·8	2·75	13
Sept.	56·9	45·4	67·5	22·1	25·8	91·8	83	5·6	1·88	10
Oct.	47·6	38·7	56·8	18·1	16·0	74·3	86	5·8	2·78	14
Nov.	42·8	36·1	49·5	13·4	15·0	64·0	87	6·7	2·39	13
Dec.	37·4	31·3	43·5	12·2	8·0	59·0	88	6·8	2·14	13
Year	48·2	38·8	57·5	18·7	1·0	94·5	83	6·2	23·64	139

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The rainfall given in these tables must not, as before mentioned, be considered to represent the mean for a long period, for, during the twelve years 1887–98, the mean annual fall in Hertfordshire was nearly two inches below that for the sixty years 1840–99. During this period, deducing the mean from the records of 1 station for 1840–49, 2 stations for 1850–59, 7 for 1860–69, 12 for 1870–79, 18 for 1880–89, and 20 for 1890–99, the result is thus :—

	ins.		ins.		ins.		ins.
March	1·65	June	2·05	Sept.	2·35	Dec.	2·04
April	1·69	July	2·48	Oct.	2·96	Jan.	2·22
May	2·06	Aug.	2·44	Nov.	2·56	Feb.	1·65
Spring	5·40	Summer	6·97	Autumn	7·87	Winter	5·91

The total for the year is 26·15 inches. The greatest rainfall in any year during this period was 37·59 ins. in 1852, and the least was 17·67 ins. in 1854.

The last two tables give the results of certain other observations which have been recorded at Berkhamsted and Bennington. The temperature of the soil at Bennington, at one foot beneath the surface, has been taken only during the eight years 1891–98, and at two feet beneath the surface for the two years 1897–98, so that the records are not strictly comparable with those at Berkhamsted, which have been taken for the whole period of twelve years. Nor are the records of sunshine, for two reasons. They have only been taken at Bennington for the ten years 1889–98, and the record is that of a Jordan photographic sunshine-recorder. Not only does this give results which differ from those given by a Campbell-Stokes burning-glass, but the constancy of the actinic sensitiveness of the recording paper cannot be relied upon. The sensitiveness of the paper decreases the longer it is kept, and may (in fact does) vary from time to time as provided. With the Campbell-Stokes recorder, on the other hand, it is only necessary to see that the focus is accurate and to keep the surface of the glass clean and bright. It does not therefore necessarily follow that the duration of bright sunshine at Bennington is nearly three-quarters of an hour per diem longer at Bennington than it is at Berkhamsted, the record for which place of very nearly four hours per diem we may assume to be the more correct. However this may be, these tables show that while the sky is clear at 9 a.m. for about the same number of days in the year at both places, it is then completely overcast for 20 more days in the year on the average at Bennington than it is at Berkhamsted, a fact difficult to account for.

The other results in these tables accord very well, except that the barometric pressure is higher at Bennington than at Berkhamsted. The difference of one-hundredth of an inch is, however, very small. We cannot look for the cause in the slightly greater dryness of the air at Bennington, due to the more exposed situation and drier soil, for the presence of moisture in the air increases its pressure, but we may trace a result in the smaller rainfall there.

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BERKHAMSTED.

(Rosebank.)

Latitude: 51° 45′ 40″ N. Longitude: 0° 33′ 30″ W. Altitude: 400 feet.

Observer: *Edward Mawley, V.P.R.Met. Soc.*

1887–98	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	30·062	35·0	34·3	36·4	38·0	2	18	43	6·8	14
Feb.	·094	35·9	34·9	37·9	39·1	3	13	67	9·2	8
March	29·899	40·1	38·0	40·7	41·1	5	11	115	10·6	5
April	·964	45·9	42·5	47·2	46·8	4	10	148	12·6	3
May	·991	53·0	48·3	54·4	53·1	5	10	193	15·1	3
June	30·039	59·0	54·7	60·8	59·2	3	10	182	14·8	2
July	29·969	61·1	56·0	63·4	62·5	3	12	182	14·4	2
August	·954	60·3	56·1	62·5	62·4	3	8	178	12·6	2
Sept.	30·045	56·3	53·3	58·5	59·4	5	9	137	10·8	3
Oct.	29·925	46·9	45·3	50·2	52·4	5	11	101	9·8	6
Nov.	·979	41·9	40·9	44·5	46·7	3	16	51	8·1	12
Dec.	·987	36·5	35·8	39·1	41·4	2	16	36	6·2	16
Year	29·992	47·7	45·0	49·6	50·2	43	144	1433	15·1	76

BENNINGTON.

(Bennington House.)

Latitude: 51° 53′ 45″ N. Longitude: 0° 5′ 20″ W. Altitude: 407 feet.

Observer: *Rev. J. D. Parker, LL.D., F.R.Met. Soc.*

1887–98	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	30·074	35·2	34·4	37·0	40·3	3	18	59	8·0	13
Feb.	·102	36·0	34·9	38·4	40·6	3	13	87	9·7	8
March	29·909	40·3	38·2	40·8	41·8	4	14	143	12·3	3
April	·976	46·2	42·8	46·6	45·8	4	12	175	13·8	3
May	30·001	52·9	48·4	52·4	51·1	4	12	219	15·0	3
June	·049	59·0	54·4	59·4	57·3	3	13	209	15·5	2
July	29·976	61·4	56·3	62·1	62·2	2	13	204	15·2	1
August	·963	60·8	56·4	61·4	62·7	4	10	196	13·8	2
Sept.	30·053	56·9	53·5	57·8	54·5	6	12	166	12·1	2
Oct.	29·935	47·7	45·8	50·4	53·9	5	13	112	10·5	6
Nov.	·990	42·4	40·7	44·6	48·4	2	17	67	8·6	11
Dec.	·999	37·2	36·2	40·2	43·4	4	17	54	8·7	13
Year	30·002	48·0	45·2	49·3	50·5	44	164	1691	15·5	67

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The direction and force of the wind remain for consideration. With regard to direction, the following are the mean results of observations at Berkhamsted, St. Albans, and Bennington for the twelve years:—N. 36·1 days in the year, N.E. 36·4, E. 29·4, S.E. 25·8, S. 39·3, S.W. 61·5, W. 61·4, N.W. 32·2, and calm 43·2, making together 365·3 days, the inclusion of three leap years adding a little to the mean number of days. Referred to the four cardinal points of the compass and neglecting fractions of days the result is: N. 70 days, E. 61, S. 83, W. 108; and referred to the intermediate points: N.E. 69 days, S.E. 61, S.W. 112, N.W. 80; to which must be added in either case 43 calm days. This shows how greatly south-westerly winds predominate.

For the direction of the wind in each month I have only worked out my own observations at St. Albans, and according to them in the twelve years January had the greatest number of calm days (3·6), April of days with N.E. (6·2) and E. (3·2) winds, May of N. (5·4) and N.W. (4·6), August of S.W. (8·4) and W. (5·7), November of S.E. (3·3), and December of S. (5·5). February had the least number of days of S.W. winds (3·4), March of S.E. (1·8) and calm (1·1), April of S. (2·3), May of W. (2·8), August of N.E. (1·9), October of E. (0·9), November of N.W. (2·3), and December of N. (1·9). The largest number of days in any month with the wind in any one direction is 8·4 of S.W. winds in August; it is most nearly approached in July, which has on the average 6·6 days of S.W. winds; and the next largest number is 6·2 days of N.E. winds in April and the same number of S.W. winds in November.

With regard to the force of the wind there are anemometers at Berkhamsted and Bennington, but their records have not been published, and I have only the results of my own observations of the estimated force at St. Albans to rely upon. In the absence of an anemometer the wind-force is estimated on the Beaufort scale, 0 representing calm and 12 a hurricane. As the extreme force is (fortunately) never experienced in this country, it is difficult to say how nearly it is approached in a severe gale, and it is not always easy to say whether the air should be considered as calm or as having the force 1. I have entered it as calm when my vane (which moves with a *very* gentle breeze) was quite still, and as having the force 1 when it oscillated very slightly, and so on.

The greatest force at which I have estimated the wind at 9 a.m. on any occasion is 6; a force which has been recorded more than once in some years and not at all in others. The greatest estimated mean force in any month was 2·8 (March, 1891); the least in any month was 1·2 (January, 1887; November, 1892; September, 1893; October, 1897; and September, 1898). The mean annual force is 1·8, and it has varied in different years from 1·6 to 1·9. The wind is strongest in Spring (2·0), lightest in Summer and Autumn (1·7), and the mean of the year in Winter. It is strongest in March (2·1), and lightest in June (1·6).

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XV.

REPORT ON PHENOLOGICAL PHENOMENA OBSERVED IN HERTFORDSHIRE DURING THE YEAR 1901.

By Edward Mawley, Vice-Pres. R. Met. Soc., F.R.H.S.

Read at Watford, 25th March, 1902.

The only change in the observing stations since the last report was issued has been the removal of the observer at Wealdstone to Oxhey Lane, Watford. The distribution of the stations consequently remains as satisfactory as before. The only part of the county altogether unrepresented is the neighbourhood of Buntingford in the north-east.

The following table gives the list of observers, the districts they represent, and the approximate height of the stations above sea-level. The sequence is from south to north.

Station.	Height above Sea-level.	Observer.
Watford (Oxhey Lane)	240 feet.	G. E. Eland.
Watford (The Platts)	240 ,,	Mrs. G. E. Bishop.
Watford (Weetwood)	270 ,,	Mrs. J. Hopkinson.
Chesham (Cannon Mill Cottage)	300 ,,	Miss G. Keating.
Broxbourne	120 ,,	Rev. H. P. Waller.
St. Albans (Worley Road)	300 ,,	H. Lewis.
Berkhamsted (Rosebank)	400 ,,	Mrs. E. Mawley.
Hatfield (Symonds Hyde)	300 ,,	T. Brown.
Hertford	140 ,,	W. Graveson.
Sawbridgeworth	240 ,,	H. S. Rivers.
Harpenden (Hecla Villa)	370 ,,	J. J. Willis.
Hitchin	230 ,,	A. W. Dawson, M.A.
Ashwell (Odsey)	260 ,,	H. G. Fordham.

The Winter of 1900–01.

Regarded as a whole this was a mild winter, but during the course of it there occurred two distinct periods of cold weather, one in January, lasting about a week, and the other in February, lasting three weeks. The cold, however, was never severe, the exposed thermometer at Berkhamsted at no time registering more than 19 degrees of frost. There were comparatively few days altogether free from rain or snow, but the total quantity was about an inch in defect of the average for the quarter. The distribution of the rainfall was peculiar, more than half the total quantity having been deposited in December. The sun shone on an average at Berkhamsted for about an hour a day less than is seasonable.

The great drawback to the farmer during this season was the unworkable condition of the ground, at first through the frequent falls of rain and snow, and afterwards by the three weeks frost

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in February. Fortunately the previous autumn had been so favourable that all seasonable tillage operations were left at the end of that season in an unusually forward state. The mild weather in the early part of the winter greatly favoured the pastures and turnips, which continued in a growing condition until about Christmas. The young corn made good progress, but never became what is termed "winter proud," being kept in check by the scanty supply of sunshine and the occasional moderate frosts.

In order to show the great mildness of the weather in the early part of the winter, I may state that the last rose-bloom of the year was destroyed by frost in my garden on the 6th of January, which is exactly a month later than the average date of its destruction in the previous fifteen years, and later than in any but the first year of that period, 1885, when precisely the same date was recorded. The earliest flowers of the year came into blossom in advance of their usual time. For instance, at Berkhamsted the winter aconite was out on January 17th, or five days earlier than its average date in the preceding twelve years. But the dates recorded for plants coming into flower during and after the February frost were all more or less late.

Taking the county as a whole, the first fertile flowers appeared on the hazel twelve days later than their average date for the previous twenty-five years, and later than in any year since 1895.

The song-thrush was first heard after the beginning of the year seven days later than its mean date.

The honey-bee was first seen to visit flowers twenty-four days behind its usual time.

The Spring.

This was a spring of about average temperature, moderately warm and moderately cold periods of varying duration succeeding each other throughout the season. The most noteworthy feature as affecting vegetation was the absence of any unusual cold. On the coldest night in March, the exposed thermometer at Berkhamsted indicated 16 degrees of frost, on the coldest night in April 10 degrees of frost, and on the coldest night in May 3 degrees of frost—the seasonable extremes for these three months being respectively 18 degrees, 12 degrees, and 7 degrees of frost. The aggregate rainfall was nearly an inch in excess of the mean for the quarter. Although on the whole a wet spring, there occurred during the course of it two very dry periods, each lasting about three weeks. The sun shone at Berkhamsted for more than half an hour a day longer than usual.

As regards the cultivation of the land, this proved even a more trying season than the winter had been. In fact, it was not until after the middle of April (an exceptionally late date) that the sowing of spring corn could be satisfactorily proceeded with, owing to the previous persistent falls of rain and snow. This remark refers to the wet half of the season. Fortunately, when the change to dry weather did come the ground worked splendidly, and rapid

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progress was made. For the other crops the change was too complete, for before the end of the quarter rain was becoming urgently needed for the grass, and also for the germination of the seeds of turnips and other roots.

In the gardens the conditions were equally unpropitious as regards the cultivation of the ground and seed-sowing. On the other hand, the absence of any unusually keen frosts was a welcome feature of this spring. The apple-trees flowered very irregularly, but in most parts of the county the show of blossom was very sparse. The blossom on the pears, plums, and cherries appears to have been fairly abundant. This irregularity in the blossoming of flowering trees and shrubs was rather a feature of the season. For instance, at Berkhamsted the lilacs have seldom flowered so profusely, while there was but a scanty show of blossom as a rule on the hawthorns.

Nearly all the spring flowers were behind their mean dates, but after the blackthorn the departures from the average were not nearly so great. The coltsfoot was fourteen days late, the wood-anemone twenty-four days late, the blackthorn sixteen days late, the garlic hedge-mustard seven days late, the horse-chestnut one day early, the hawthorn eight days late, and the white ox-eye four days late.

As had been the case in the two previous years, the spring migrants arrived somewhat later than usual. The swallow was three days late, the cuckoo six days late, the nightingale two days late, while the flycatcher (taking its average date for the eight years for which observations are available) was one day early.

The wasp made its appearance fourteen days late, while the small white butterfly and the orange-tip butterfly were both nine days late. Only two observers sent in dates for the meadow-brown butterfly.

The Summer.

This was a very warm, dry, and exceptionally bright season. July proved exceptionally warm, the highest temperature in shade on as many as ten days exceeding 80 degrees. The rainfall was not only much below the average, but also very unequally distributed over the season. In fact, if the last week in August be omitted, there were only four days, and those widely separated, when a quarter of an inch of rain or more was deposited. The average daily duration of bright sunshine at Berkhamsted exceeded the mean for the quarter by as much as one hour and a half a day.

From the above description of the weather it will have been gathered that the summer of 1901 was by no means a favourable one for farm- and garden-crops. Owing to the want of rain, the grass made scarcely any growth, and consequently the yield of hay was one of the lightest on record. The crop was, however, quickly harvested, and in excellent condition. From this time throughout the summer there was very little grass in the pastures, except where the situation is low and moist. The wheat withstood the drought well, especially that sown in the autumn, but barley

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TABLE I.—DATES OF FLOWERING OF PLANTS OBSERVED IN 1901, WITH THE MEAN DATE FOR 1876–1900.

SPECIES.	WATFORD.			CHESHAM.	BROXBOURNE.	BERKHAMSTED.	HATFIELD.	HERTFORD.	SAWBRIDGEWORTH.	HARPENDEN.	HITCHIN.	ODSEY (Ashwell)	MEAN.
	OXHEY LANE.	THE PLATTS.	WEETWOOD.										
Hazel (*Corylus avellana*)	.....	Jan. 22	.....	Jan. 30	Jan. 31	Mar. 3	Mar. 3	Jan. 26	Feb. 14	Feb. 19	Feb. 10	.....	Jan. 29
Coltsfoot (*Tussilago farfara*)	Apl. 8	Mar. 26	.....	.....	Feb. 25	Mar. 15	Mar. 18	Feb. 24	Mar. 13	Mar. 13	Mar. 3	.....	Feb. 27
Wood-Anemone (*Anemone nemorosa*)	Apl. 21	Apl. 16	.....	.....	.....	Apl. 20	Apl. 21	Apl. 3	Apl. 17	.....	Apl. 5	.....	Mar. 22
Blackthorn (*Prunus spinosa*)	Apl. 23	Apl. 17	Apl. 24	Apl. 17	Apl. 26	Apl. 21	Apl. 24	Apl. 5	Apl. 22	Apl. 21	Apl. 5	.....	Apl. 3
Garlic Hedge-Mustard (*Alliaria officinalis*)	.....	Apl. 23	Apl. 25	May 7	.....	Apl. 30	.....	Apl. 24	.....	Apl. 26	.....	.....	Apl. 20
Horse-Chestnut (*Æsculus hippocastanum*)	May 6	May 10	May 5	May 9	.....	May 12	May 4	May 5	May 14	May 4	May 9	May 11	May 9
Hawthorn (*Cratægus oxyacantha*)	May 20	May 20	May 18	May 25	.....	May 26	May 16	May 14	May 26	May 25	May 10	May 21	May 12
White Ox-Eye (*Leucanthemum vulgare*)	May 17	June 5	May 28	May 18	.....	May 25	May 22	May 23	.....	May 31	May 19	.....	May 20
Dog-Rose (*Rosa canina*)	June 5	.....	May 29	June 17	.....	June 4	.....	June 6	June 1	June 4	June 3	May 30	June 5
Black Knapweed (*Centaurea nigra*)	.....	.....	.....	July 15	.....	July 8	July 9	July 3	June 22	June 20	June 21	.....	June 24
Harebell (*Campanula rotundifolia*)	July 23	.....	July 1	.....	.....	July 15	July 10	July 7	.....	July 29	.....	.....	July 5
Greater Bindweed (*Convolvulus sepium*)	.....	.....	.....	June 22	.....	July 5	.....	July 7	June 24	July 10	.....	.....	July 9
Ivy (*Hedera helix*)	.....	Sept. 28	Sept. 12	Oct. 4	Sept. 15	Sept. 26	.....	Sept. 29	Sept. 16	.....	.....	Sept. 22	Sept. 27

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TABLE II.—EARLIEST DATES OF OBSERVATION OF BIRDS AND INSECTS IN 1901, WITH THE MEAN DATE FOR 1876–1900.

SPECIES.	WATFORD.			CHESHAM.	BROXBOURNE.	ST. ALBANS.	BERKHAMSTED.	HATFIELD.	SAWBRIDGEWORTH.	HARPENDEN.	HITCHIN.	ODSEY (Ashwell)	MEAN.
	OXHEY LANE.	THE PLATTS.	WEETWOOD.										
BIRDS.													
Song-Thrush (*Turdus musicus*)	....	Jan. 5	....	....	Jan. 16	Jan. 19	Feb. 15	Feb. 26	Jan. 2	Jan. 21	....	....	Jan. 17
Swallow (*Hirundo rustica*)	Apl. 20	Apl. 18	Apl. 10	Apl. 15	Apl. 8	Apl. 19	Apl. 9	Apl. 23	Apl. 13	Apl. 8	Apl. 16	Apl. 18	Apl. 12
Cuckoo (*Cuculus canorus*)	Apl. 20	Apl. 16	Apl. 21	Apl. 18	Apl. 16	Apl. 5	Apl. 18	Apl. 22	Apl. 21	Apl. 20	Apl. 21	Apl. 27	Apl. 13
Nightingale (*Daulias luscinia*)	Apl. 17	Apl. 20	Apl. 22	....	Apl. 6	Apl. 11	Apl. 21	Apl. 12	Apl. 20	Apl. 20	Apl. 12	Apl. 21	Apl. 15
Spotted Flycatcher (*Muscicapa grisola*)	....	....	....	....	May 13	....	May 12	May 8	Apl. 22	....	May 20	May 27	May 13 (8 years)
Swallow (last seen) (*Hirundo rustica*)	Oct. 5	Sept. 7	Oct. 10	Oct. 8	Oct. 13	....	Sept. 27	....	Oct. 23	....	....	Oct. 12	Oct. 18 (10 years)
INSECTS.													
Honey-Bee (*Apis mellifica*)	....	....	Feb. 28	....	Feb. 12	....	Feb. 28	....	Feb. 28	....	....	....	Jan. 31
Wasp (*Vespa vulgaris*)	....	....	Apl. 20	May 13	Mar. 26	....	Apl. 22	....	Apl. 21	Apl. 22	....	....	Apl. 6
Small White Butterfly (*Pieris rapæ*)	Apl. 21	Apl. 20	Apl. 7	....	Apl. 7	....	Apl. 19	....	Apl. 18	Apl. 8	....	....	Apl. 5
Orange-Tip Butterfly (*Anthocaris cardamines*)	....	....	May 14	May 14	....	....	May 12	....	May 12	May 28	....	....	May 7
Meadow-Brown Butterfly (*Epinephile janira*)	....	....	....	....	....	....	June 30	....	June 17	....	....	....	May 19

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and oats were thin, and made but poor growth. Of the root-crops, the mangolds, as is usual in a dry season, suffered less from the absence of moisture in the ground than either turnips or swedes, which were able to make but little progress, and in some cases had to be repeatedly resown. Mr. Willis states that at Harpenden "the cold drying winds, together with the drought of the month of June, were exceedingly trying to vegetation. In this neighbourhood large areas of oats and barley are not more than six inches high." From Harpenden Mr. Willis also reports that the first wheat-ear was observed out of its sheath on June 10th, or one day later than its average date in the previous nine years.

The same adverse conditions prevailed in the gardens. Vegetables made but little growth in the kitchen-garden, and in the flower-garden the blossoming period of most plants was much curtailed; added to this, roses received a severe check from a marked period of cold weather in the middle of June. In order to show how dry the ground at one time was, I may state that during the five consecutive weeks ended July 12 no rain-water whatever came through my bare soil percolation-gauge, containing two and a half feet of soil. At Harpenden, "on the night of June 19th, a frost occurred which cut down the potato haulms, and also the scarlet-runner and dwarf-runner beans, especially in the low-lying parts of the parish." At Broxbourne, green vegetables and potatoes are stated to have suffered considerably from the dry weather.

The summer flowering plants are very irregular in their dates, the two deep-rooting ones, the dog-rose and the greater bindweed, being respectively two and seven days early, while the shallow-rooting black knapweed and harebell, which were more under the influence of the dry weather, were respectively seven and nine days late.

The Autumn.

Although September and October were both moderately warm months, November was so cold that the mean temperature of the whole season comes out only about average. The rainfall again proved deficient. In fact, the total quantity was less than half the mean for the quarter. The record of clear sunshine at Berkhamsted was as nearly as possible its average duration for the quarter.

The corn ripened rapidly, and the ingathering lasted in many parts of the county so short a time that the harvest may be said to have belonged more to the summer than to the usual harvest month—September. There were some interruptions through rain towards the end of August; otherwise the weather proved singularly fine. Turnips and swedes made fair progress during the cooler weather of this quarter, but the roots were, of course, only able to partially regain the ground they had lost during the summer. Mangolds fared better, and here and there really good crops were to be met with. The pastures gradually revived after the welcome October rains, and during the rest of the season there was plenty of keep in them for the sheep and cattle. After the close of the harvest,

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it was some time before autumn tillage operations could be commenced, so hard had the ground become owing to the summer and early autumn drought. When sufficiently moistened, however, the tilth was all that could be wished, as is invariably the case at this season after a long spell of dry weather.

Seldom have the gardens of Hertfordshire been as gay with flowers at this time of year as they were during the first two months of this autumn. My single dahlias, when still in full flower, were killed by frost on October 27, which is nine days earlier than usual, and earlier than in any year for six years. Mrs. G. E. Bishop reports that on the same night her dahlias were killed at Watford.

The winter supply of green vegetables in the kitchen-garden improved, but the change to wet weather took place too late to be of any material service to them.

The yield of the principal farm crops, taking the county as a whole, was, according to the returns sent in to the 'Agricultural Gazette,' as follows:—Wheat was the best grain crop of the year, but even this was, if anything, rather below the average than otherwise. Barley and oats were both deficient crops, and the same may be said of hay, beans, peas, potatoes, and turnips. On the other hand, mangolds yielded well.

The fruit crops were also equally disappointing. According to the returns sent in to the 'Gardeners' Chronicle,' apples, pears, and plums were all below average, especially apples. Mr. W. B. Morle, writing from Frythesden Gardens, Berkhamsted, says: "We have seven acres of apple-trees, and not a bushel of fruit."

There were, as usual, good crops of all the small fruits.

The ivy was four days in advance of its average date in coming into flower.

The swallow took its departure twelve days earlier than its mean date for the previous ten years.

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XVI.

NOTES ON BIRDS OBSERVED IN HERTFORDSHIRE DURING THE YEAR 1901.

By William Bickerton.

Read at Watford, 25th March, 1902.

As only three weeks have elapsed since the Council of this Society asked me to take up the duties of Recorder of Hertfordshire Birds in succession to Mr. Alan F. Crossman, I feel sure that you will not anticipate anything in the nature of a detailed report, for, until I have been able to place myself in communication with the various local recorders, and to tabulate the results of their observations, it is obviously impossible for me to deal at length with the records of the past year. I will therefore only refer very briefly to a few records of more than general interest which have been brought to my notice during the year. In so doing I desire to take advantage of this opportunity to appeal to members of the Society generally to send to me whatever notes and observations they can about the bird-life of the county.

I can scarcely hope to add many items to the interesting and practically exhaustive list of Hertfordshire birds compiled by Mr. Crossman as the result of the labours of his predecessors, his co-workers, and himself. Nor, indeed, should it be the only or even the main object of our work simply to record the accidental appearance of some stray visitor to our county, although such appearances are extremely interesting to the naturalist, and, may we say, as a general rule extremely unfortunate for the visitors themselves, which is much to be regretted. We should all like to know more, not only of the distribution, but also of the real life and habits of our feathered friends within the county, and valuable information upon these matters can be garnered and communicated by anyone who will take a little trouble and exercise a little patience. Let me repeat, therefore, that I shall be glad to receive any notes, however few, however casual, or however commonplace they may be; and I shall especially hope to be favoured with notes from different districts in the county, and from as extensive an area as possible.

So much by way of preface. I will now give the few notes which I have to report.

The first one is not only of a bird new to Hertfordshire, but apparently also to the British Isles. It is the appearance at Tring of a Baer's Pochard (*Nyroca Baeri*), shot there on November 5th, and exhibited by the Hon. N. Charles Rothschild at a meeting of the British Ornithologists' Union on November 20th. The bird in question is an Asiatic duck which has never before been obtained in the British Isles, and the only question to determine was whether this specimen was a truly wild bird or an escape. It had no appearance of having been in captivity, and Mr. Rothschild has

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satisfied himself that it had not escaped from the Zoological Gardens, Regent's Park, where there are four pinioned birds of the species. The Duke of Bedford and Mr. J. G. Millais, in reply to enquiries, stated that they were not aware of any of these birds having been turned out on artificial waters in this country.

The evidence therefore points to the fact that this bird was a truly wild one, which had doubtless lost its way and wandered to this country.

The following are observations of a few interesting species which have before been recorded for our county.

Blackcap Warbler (*Sylvia atricapilla*).—I am indebted to Mr. A. E. Gibbs for a most interesting record of a couple of female blackcap warblers which were seen during the bitterly cold weather of February, 1902, in a garden at St. Albans. Mr. Groves, of London Road, St. Albans, observed some "strange birds" which paid daily visits to his garden, and finally concluded that they were female blackcaps. His observations and conclusion were alike confirmed by other gentlemen who distinctly recognized the brown chestnut cap so characteristic of the female of this species.

It would be unwise, I think, to refer this interesting record to an unusually early appearance of one of our Summer migrants, which does not appear as a rule until April. It is more satisfactory to conclude that these birds had passed the Winter with us. To include this record in my report for the year 1901 is not, therefore, so inappropriate as it might otherwise seem to be.

Great Grey Shrike (*Lanius excubitor*).—The following note appeared in the 'Herts Advertiser' of the 9th of February, 1901:—"Last week, on the top of a small tree near Sandpit Lane and the Midland Railway, St. Albans, might have been seen, during several days, a fine specimen of the greater shrike (*Lanius excubitor*), croaking forth his weird note. This bird is not supposed, by some writers, to breed in this country at all. It is an abnormal Winter visitor, and belongs to the tribe of butcher-birds, which derive their name from the habit they have of hanging their prey, young birds, frogs, etc., on the points of thorns, the object of the bird being, apparently, two-fold—first to secure the prey so that it may be more easily torn asunder, and secondly to preserve something for the next meal." The shrike, it was added, was a very handsome bird which allowed the observer "to approach so near that the main features of his beautiful pearly grey plumage and black stripe across the eye could be seen quite distinctly."

Kestrel (*Falco tinnunculus*).—The following, which I think is worthy of report, is taken from the correspondence column of 'Country Life' for the 30th of November, 1901:—"The other morning, about 8 o'clock, while I was cycling down a lane between Thornhill and Maplecross, a cloud of small birds came over the hedge on my right, passing all round me. At the same moment a kestrel swooped at them, not seeing me until he was quite close to my brown cap, when he screamed and tried to turn. I put up my hand to screen my face and either I caught him or he caught

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me, for his talons were firmly fixed in my woollen gloves. The stationmaster and several regular passengers were present when I rode in with my capture to Rickmansworth Station, and assisted my awkward efforts to brace him, during which, with tooth and nail, he took toll of several fingers. I fear that he is too old to learn manners.—*Henry J. Ford.*"

Heron (*Ardea cinerea*).—It is pleasant to be able to record that this bird has during the past year nested upon one of the large estates in the immediate vicinity of Watford, and within about two miles of the town. This is the bird's first appearance for the purposes of nidification in this particular locality, and it is very gratifying to record that the birds were carefully protected and succeeded in hatching their brood.

Shoveller (*Spatula clypeata*).—A female specimen of this bird in splendid condition was shot near Hemel Hempstead on the 2nd of December. The recorder of this fact reported it to the 'Zoologist' as the first occasion on which this species had been found in Hertfordshire. This, I may state, is not so, for Mr. Crossman reports as follows in his "List of the Birds of Hertfordshire" ('Trans. Herts Nat. Hist. Soc.,' vol. x, part 3):—"One or two pairs of this duck nest regularly at or near the Tring Reservoirs, and it has been shot on a few occasions in other parts of the county."

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VOL. XI. PART 5.

CONTENTS :

	PAGES
Meteorological Observations taken in Hertfordshire in the Year 1901. By John Hopkinson, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.	145–154
Report on the Rainfall in Hertfordshire in the Year 1901. By John Hopkinson	155–164
Notes on Lepidoptera observed in Hertfordshire in the Year 1901. By A. E. Gibbs, F.L.S., F.R.H.S.	165–172
Proceedings, Session 1900-01	ix
Report of the Council for the Year 1900. (*To be continued.*)	xi

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THE objects of the Society are:—1. The investigation of the Meteorology, Geology, Botany, Zoology, Ethnology, Pre-Norman Archæology, and Topography of the County of Hertford. 2. The publication of the results of such investigation made by its Members. 3. The dissemination amongst its Members of information on Physics and Biology. 4. The formation of a Library of works on Natural History, and of a Museum illustrative of the Geology, Botany, and Zoology of the County. 5. The discouragement of the practice of removing rare plants from the localities of which they are characteristic, and of exterminating rare birds, fish, and other animals.

Evening meetings of the Society are held in the rooms of the Watford Urban District Council (Upton House) once a month during the Winter and Spring. Evening meetings are also held occasionally at St. Albans, Hertford, and other places. Field meetings are held during the Spring and Summer in various parts of the County.

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XVII.

METEOROLOGICAL OBSERVATIONS TAKEN IN HERTFORDSHIRE IN THE YEAR 1901.

By JOHN HOPKINSON, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

THERE is no alteration in the Hertfordshire meteorological stations for the year 1901, and the observations have been taken as heretofore. The hour of observation is 9 a.m., and all the records are entered to the same day except those of the maximum temperature and the rainfall, which are entered to the previous day. At Bennington, Berkhamsted, and St. Albans the thermometers for registering the shade-temperature are in Stevenson screens; at New Barnet they are under a Glaisher stand, which accounts for the greater range of temperature there than at the other stations, while the mean temperature shows no divergence.

The averages with which the results of these observations are compared are those of the same four stations and Royston for the twelve years 1887–98, as given in my paper on "The Climate of Hertfordshire," * except the sunshine, which is compared with the average at Berkhamsted for the same period combined with that at Bennington for the ten years 1889–98,† and the rainfall, which is compared with the county average for the 60 years 1840–99.‡ The remarks on the prevailing direction of the wind refer to observations at Berkhamsted and Bennington (the means of the two), as tabulated in the 'Meteorological Record' of the Royal Meteorological Society, from which invaluable publication the sunshine records and other data in this report are derived.

TABLE I.—*Results of Climatological Observations taken in Hertfordshire in the Year* 1901.

Stations	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Bennington	48·2	40·6	55·9	15·3	16·1	87·0	80	7·0	19·53	165
Berkhamsted	48·3	40 0	56·6	16·6	15·9	87·7	81	6·9	23·66	142
St. Albans	48·2	40·8	55·5	14·7	17·8	87·5	79	6·5	22·57	147
New Barnet	48·3	38·0	58·5	20·5	9·0	91·0	82	5·7	20·42	123
County.....	48·2	39·8	56·6	16·8	9·0	91·0	80	6·5	21·55	144

In the year 1901 the mean temperature was about the average of that of the twelve years 1887–98, and a degree lower than in

* Ante, pp. 127–131. † Ib., p. 133. ‡ Ib., p. 132.

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1899 and 1900. The mean daily range of temperature was about a degree greater than usual, owing chiefly to the coldness of the nights. The air, at 9 a.m., was drier than usual, its relative humidity being 2 per cent. less than the average, and, at the same hour, there was rather less than the average amount of cloud. The sun shone on the average throughout the year 22 minutes a day longer than usual. The rainfall was small, and the number of days of rain was much below the average. Westerly winds prevailed, and south-westerly were the next in frequency.

February was a very cold month, being much the coldest in the year; July was very warm. In April and June the air was very dry, and in each of the five months April to August the sky was much brighter than the average. Very little rain fell in January, June, and November, but December was an unusually wet month, and March and April had much more than the average amount of rain. In each of the five months May to September, and in November, rain fell on a very small number of days.

TABLE II.—*Means of Climatological Observations (with Extremes of Temperature) for the Seasons of* 1900–1901.

Seasons	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Winter	38·6	33·3	43·9	10·6	9·0	56·2	90	7·4	5·30	53
Spring	45·9	36·7	55·2	18·5	20·4	84·1	76	6·3	6·17	40
Summer	61·3	50·1	72·5	22·4	32·0	91·0	70	5·5	5·49	28
Autumn	49·1	41·2	57·0	15·8	14·0	77·5	86	6·9	4·03	29

The Winter of 1900–01 (Dec. to Feb.) was mild, owing rather more to the warmth of the nights than of the days, the mean daily range of temperature being rather less than usual. The air was of average humidity, and the sky was of average brightness. The duration of sunshine averaged 20 minutes a day less than usual. The rainfall was rather small, but there was more than the average number of wet days. South-westerly and westerly winds greatly prevailed, in equal proportion.

The Spring (March to May) was rather cold, owing more to the coldness of the nights than of the days, the mean daily range of temperature being rather great. The air was much drier than usual, and the sky was of average brightness. The duration of sunshine averaged 18 minutes a day more than usual. The rainfall was rather heavy, but there was only about the average number of wet days. North-easterly winds prevailed, south-westerly and then northerly being the next in frequency.

The Summer (June to August) was very warm, owing entirely to the warmth of the days, the mean daily range of temperature

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being great. The air was unusually dry, and the sky was very bright. The duration of sunshine was unusually great, averaging an hour and 34 minutes a day in excess of the mean. The rainfall was small, the number of rainy days being exceptionally so in comparison with the amount of rain. Westerly winds prevailed, easterly and south-westerly being the next in frequency.

The Autumn (Sept. to Nov.) was of about average temperature, though the nights were colder and the days warmer than usual, the mean daily range being rather great. The air was of average humidity, and the sky was of about average brightness. The duration of sunshine averaged about 7 minutes a day less than usual. The rainfall was exceptionally small, and so also was the number of wet days. The prevailing direction of the wind was westerly, the next most frequent winds being south-westerly.

TABLE III.—*Means of Climatological Observations (with Extremes of Temperature) taken at Bennington, Berkhamsted, St. Albans, and New Barnet, during the Year* 1901.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	37·2	32·2	42·2	10·0	9·0	55·0	90	7·2	·84	15
Feb.	34·8	29·4	40·1	10·7	10·5	53·8	90	7·9	1·20	14
March	38·4	31·8	45·1	13·3	20·4	57·0	87	8·1	2·38	17
April	47·1	37·2	57·1	19·9	22·0	75·0	69	5·7	2·34	16
May	52·3	41·1	63·4	22·3	26·9	84·1	72	5·2	1·45	7
June	57·9	46·8	69·0	22·2	32·0	83·0	67	5·7	·82	10
July	64·4	52·7	76·0	23·3	39·5	91·0	70	5·4	2·73	8
August	61·8	51·0	72·6	21·6	40·1	86·1	73	5·5	1·94	10
Sept.	57·3	48·4	66·2	17·8	33·1	77·5	82	7·2	1·24	6
Oct.	49·3	41·2	57·4	16·2	24·0	74·0	89	7·1	2·02	15
Nov.	40·7	34·0	47·4	13·4	14·0	56·1	87	6·4	·77	9
Dec.	37·5	32·0	43·0	11·0	18·0	56·8	89	6·8	3·82	17
Year	48·2	39·8	56·6	16·8	9·0	91·0	80	6·5	21·55	144

JANUARY.—A rather mild month, of average humidity and cloudiness, with a very small rainfall on nearly the average number of days. Both the mean minimum and the mean maximum temperatures were a degree above the average. There was the usual duration of sunshine; rather less than two hours a day. The prevailing direction of the wind was westerly. The first nine days and the last four were rather cold, and it was during these periods only that any snow fell; in the earlier period on the 6th, 7th, and 8th, and during the later on the 26th and 27th, with hail, and on the 31st. Mr. Mawley remarks that the 27th was the most windy day but one which he has ever recorded at Berkhamsted in any month, the force of the wind from 9 a.m. until

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midnight being that of a gale, and the strongest gusts, from the west, rising to a rate of 45 miles per hour. Much damage was done at various places in the county. At Codicote two of the large ornamental chimneys of the Vicarage were blown down, other chimneys and roofs in the village suffered, and several trees were uprooted; and in Hertford and its neighbourhood several large trees were blown down or broken off, and chimneys and roofs were damaged by the force of the wind.

FEBRUARY.—A very cold month, with a humid atmosphere, a cloudy sky, and a rather small rainfall on about the average number of days. The mean temperature was 3 degrees below the average, the defect being twice as much due to the coldness of the days as to that of the nights; the mean daily range was therefore smaller than usual. The sun shone for only an hour and a half a day on the average, being little more than half the usual duration. The wind blew mostly from the west, north-west, and north. Nearly all the precipitation was in the form of snow, except about a quarter of an inch of rain on the 28th and a rather smaller quantity, with some snow, on the 26th. The 14th was much the coldest day; at St. Albans the minimum during the previous night was 18°, and by 9 a.m. the temperature had only risen to 25°. Only twice since these records began have we had a colder February; in 1888 when it was a little colder, and in 1895 when it was much colder, the mean for the county being 28°·1. The last week was the only moderately warm period in the month.

MARCH.—Also a very cold month, being but little more than a degree warmer than January, and having a humid atmosphere, a very cloudy sky, and a heavy rainfall on a large number of days. The days were much more unseasonably cold than the nights, the mean temperature being 2½° below the average, but the mean maximum 4° below it. The mean daily range of temperature was therefore small. The sun shone only two hours and a half a day on the average; an hour and a half a day less than usual. North-easterly winds very greatly prevailed, and the next in frequency were south-westerly. The first five days, the 12th, and the 31st, were warm, these being the only days on which, at St. Albans, the temperature rose to 50°. Rain fell every day for the first eight days, with a little snow and hail occasionally, and on nearly every day from the 15th there was rain, snow, or hail, several days having rain and snow or rain and hail, and some having all three. The general character of the month may be summed up as cold, wet, gloomy, humid, and calm, and its usual "peck of dust" was certainly wanting.

APRIL.—Rather warm on the whole, with a very dry atmosphere, a bright sky, and a heavy rainfall on a large number of days. The apparent paradox in these conditions may be explained by the fact of the first and second halves of the month having two distinct types of weather, the heavy and continuous rainfall of the first sixteen days giving the month one character, and the dry atmosphere and bright sky of the last fourteen days more than counterbalancing

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TABLE IV.— *Climatological Observations taken at* BENNINGTON HOUSE, BENNINGTON. *Latitude:* 51° 53′ 45″ N. *Longitude:* 0° 5′ 20″ W. *Altitude:* 407 *feet. Observer:* REV. J. D. PARKER, LL.D., F.R.Met.Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	37·3	32·6	42·0	9·4	16·1	53·2	92	7·5	·66	16
Feb.	34·5	29·8	39·1	9·3	18·1	50·8	92	8·4	1·08	20
March	37·9	31·8	44·0	12·2	22·1	53·2	87	8·7	1·74	19
April	47·5	38·3	56·7	18·4	28·9	72·3	66	6·2	1·89	15
May	52·3	42·2	62·5	20·3	35·7	80·5	70	5·6	1·15	8
June	58·0	47·5	68·4	20·9	38·9	79·0	65	6·2	·82	12
July	64·6	53·5	75·7	22·2	47·8	87·0	68	6·4	3·62	8
August	61·9	52·3	71·5	19·2	43·5	81·8	71	5·9	1·95	11
Sept.	57·3	49·3	65·3	16·0	41·9	72·1	80	8·0	1·07	7
Oct.	49·3	41·8	56·8	15·0	30·1	71·8	88	7·4	1·54	18
Nov.	40·8	34·9	46·8	11·9	22·9	53·0	87	6·6	·87	13
Dec.	37·6	32·8	42·4	9·6	21·8	54·3	91	6·9	3·14	18
Year	48·2	40·6	55·9	15·3	16·1	87·0	80	7·0	19·53	165

TABLE V.— *Other Meteorological Observations taken at Bennington by the Rev. Dr. Parker.*

Months	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	30·067	35·7	34·9	39·0	40·4	0	18	58	6·8	13
Feb.	·095	33·1	32·5	36·0	37·3	2	17	45	6·3	9
March	29·820	37·2	35·8	39·1	39·8	1	16	82	9·6	2
April	·889	48·6	43·4	45·6	45·1	6	5	213	13·7	1
May	30·123	53·3	48·5	53·2	52·7	7	10	246	15·0	0
June	·080	59·0	52·7	60·3	59·8	1	8	259	14·8	1
July	·033	65·9	59·8	65·4	64·6	7	10	249	14·8	2
August	·076	62·5	57·3	63·9	64·0	6	9	240	13·8	1
Sept.	29·964	57·0	53·8	58·5	59·1	3	11	134	11·2	1
Oct.	·964	48·9	47·3	51·6	53·1	4	13	110	9·0	6
Nov.	30·189	39·8	38·2	42·9	44·8	6	13	90	8·6	11
Dec.	29·680	36·8	35·8	38·9	40·2	3	16	56	6·1	9
Year	29·998	48·2	45·0	49·5	50·1	46	146	1782	15·0	56

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the humidity and cloudiness of the wet period, and thus imparting to it a character which seems incompatible with a wet month. The average duration of sunshine was nearly an hour and a half a day longer than usual. The most frequent winds were from the south-east, the next in frequency being south-westerly and westerly. Rain, sometimes with hail, fell every day but one or two for the first sixteen days, but during the last fourteen only about a twentieth of an inch fell on the 26th and (or) 27th. In describing the weather of the week ending April 17th at Berkhamsted, Mr. Mawley refers to the decided humidity and the absence of bright sunshine, but of the following week he remarks that the sun shone for ten hours longer than during the previous sixteen days, and that the most exceptional feature of the week was the great dryness of the air; and again, of the next week (ending May 1st), he says that it had "a splendid record of sunshine," and that the atmosphere was "unusually dry."

MAY.—Of average temperature, with a dry atmosphere, a bright sky, and a small rainfall on a very small number of days. The nights were colder and the days warmer than usual, the mean daily range of temperature being great, but on no occasion was there a frost which did any injury to vegetation. The first half of the month was decidedly colder than the second half. The average duration of sunshine was nearly 8 hours a day, being more than an hour a day in excess of the mean for the month. Mr. Mawley reports its duration at Berkhamsted of 7½ hours a day as being the highest record for May for fifteen years except in 1895 and 1897; also that in the same period no other May has had so calm an atmosphere, and in only three has the air been drier. Nearly all the rain in the month fell on the 7th, 8th, and 9th, except about a quarter of an inch on the 29th and 30th together, and at none of our four stations was there an appreciable quantity between the 10th and the 29th. Hail fell on the 7th and 8th.

JUNE.—A month of very similar character to May, with the mean temperature a little below the average, a very dry atmosphere, a bright sky, and a very small rainfall on a small number of days. The mean minimum temperature was 2 degrees below the average, but the mean maximum only very slightly in defect, the daily range therefore being greater than usual. The weather was continuously cold from the 10th to the 20th. The average duration of sunshine was rather greater than in May, and an hour and a half a day in excess of the mean for the month. The wind was mostly southerly and south-westerly. Nearly half the total rain in the month fell on the 29th and 30th. Referring to the exceptionally small amount of moisture in the air, Mr. Mawley remarks that during the last fifteen years at Berkhamsted only twice previously has the atmosphere in June been so dry.

JULY.—Very warm, with a dry atmosphere, a bright sky, and a rather heavy rainfall but very few wet days. The excess in temperature was much greater in the days than in the nights, the mean minimum being less than 1½ degree above the average, and

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TABLE VI. — *Climatological Observations taken at* ROSEBANK, BERKHAMSTED. *Latitude:* 51° 45′ 40″ N. *Longitude:* 0° 33′ 30″ W. *Altitude:* 400 *feet. Observer:* EDWARD MAWLEY, F.R.Met. Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	37·5	32·7	42·3	9·6	18·4	52·5	92	7·6	1·14	16
Feb.	34·8	29·7	39·8	10·1	15·9	52·5	91	7·8	1·44	14
March	38·5	32·1	44·9	12·8	20·4	54·5	87	8·2	2·64	16
April	47·2	37·4	57·1	19·7	26·8	72·5	68	6·1	2·46	17
May	52·4	41·3	63·4	22·1	32·7	79·3	70	5·9	1·70	6
June	57·8	47·0	68·6	21·6	34·9	78·9	66	5·9	·91	10
July	64·4	53·0	75·8	22·8	44·7	87·7	70	5·4	2·61	8
August	61·7	50·9	72·6	21·7	43·5	82·3	72	6·2	1·98	10
Sept.	57·4	48·4	66·3	17·9	37·1	72·6	83	7·7	1·20	6
Oct.	49·2	41·2	57·3	16·1	28·3	72·1	91	7·6	2·18	14
Nov.	40·9	34·1	47·6	13·5	18·4	55·0	89	7·0	·78	7
Dec.	37·6	32·2	43·1	10·9	19·8	55·5	92	7·0	4·63	18
Year	48·3	40·0	56·6	16·6	15·9	87·7	81	6·9	23·66	142

TABLE VII. — *Other Meteorological Observations taken at Berkhamsted by Mr. Mawley.*

Months	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	30·038	35·2	34·4	38·2	40·6	2	17	46	5·0	14
Feb.	·070	33·2	32·5	35·5	37·7	2	17	43	5·3	9
March	29·783	37·5	36·0	39·5	40·8	1	9	80	8·4	5
April	·855	48·8	44·0	47·0	46·4	5	6	189	12·5	1
May	30·104	53·3	48·5	55·7	54·7	8	7	236	14·1	0
June	·065	58·8	52·8	62·3	61·3	2	5	233	14·0	1
July	·015	66·1	60·6	67·8	66·7	8	6	228	13·5	0
August	·058	62·3	57·3	65·1	65·5	6	8	231	13·0	1
Sept.	29·936	57·0	54·2	59·7	60·8	2	11	117	11·3	1
Oct.	·945	48·2	47·0	51·8	54·4	2	12	91	8·5	7
Nov.	30·175	38·4	37·1	41·8	45·4	6	15	70	7·8	10
Dec.	29·653	36·2	35·3	37·5	40·1	4	13	42	4·9	14
Year	29·975	47·9	45·0	50·2	51·2	48	126	1605	14·1	63

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the mean maximum more than 5 degrees above it, the daily range, as in May and June, being great. The maximum temperature exceeded 80° on the 5th, 10th to 12th, and 17th to 21st, and 85° on the 11th, 18th, 19th, and 20th. The duration of sunshine was about the same as in May, and as much in excess of the mean as in June. The prevailing direction of the wind was easterly and south-easterly. The only fall of rain between the 2nd and the 22nd was on the 12th, the result of a thunderstorm. It was a very heavy one locally, and caused serious floods at Watford. Very large hailstones also fell, some about the size of walnuts, and did much damage to gardens. How local this storm was may be seen from the amount of rain gauged at our four stations: Bennington, 0·12 in.; Berkhamsted, 1·22 in.; St. Albans, 0·37 in.; New Barnet, 0·00 in. From about the 23rd to the 28th rain fell every day to a rather large amount during a succession of thunderstorms.

August.—Rather warm, with a dry atmosphere, a bright sky, and a rather small rainfall on a small number of days. The excess in the temperature was entirely due to the warmth of the days, the mean maximum being 2½° above the average, while the mean minimum was a little below it, giving a considerable mean daily range. The maximum temperature exceeded 80° on the 9th, 10th, and 25th, and on the 9th the range was nearly 26° at St. Albans and 30° at Berkhamsted. On several other days it was nearly as great. The duration of sunshine was nearly equal to that in July, and rather more in excess of the mean for the month. The wind was generally light. Its most frequent direction was westerly, then southerly, and then, nearly as frequently, south-westerly. Scarcely any rain fell until the 14th, and none from the 16th to the 24th. There were thunderstorms a day or two before and after this dry period.

September. — Rather warm, with an atmosphere of average humidity, a cloudy sky, and a small rainfall on very few days. The mean daily range of temperature was about the same as usual. There was less than the average duration of sunshine; 4 hours a day against an average of 5 hours. The air was very calm; at Berkhamsted Mr. Mawley recorded an average velocity at thirty feet above the ground of less than three miles an hour, and a maximum velocity not exceeding fourteen miles in any one hour. All the rain in the month fell during the second and third week, and about half on one day, the 16th. This is the first month since March in which the humidity and cloud have not been much less than the average, and in which the sunshine has not greatly exceeded the average.

October.—Another rather warm month, the mean temperature being a little more in excess of the average than in September, with a rather humid atmosphere, a cloudy sky, and a rather small rainfall for the month with the highest average in the year, on nearly the usual number of days. The excess in temperature was a little more due to the warmth of the days than of the nights, the mean daily range being slightly above the average. The first

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TABLE VIII.—*Climatological Observations taken at the* HERTFORDSHIRE COUNTY MUSEUM, ST. ALBANS. *Latitude:* 51° 45′ 15″ N. *Longitude:* 0° 19′ 56″ W. *Altitude:* 389 *feet. Observer:* JOHN HOPKINSON, F.R.Met. Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	37·1	32·6	41·6	9·0	17·8	52·5	89	7·2	·86	14
Feb.	34·8	30·0	39·6	9·6	18·2	50·0	89	8·0	1·39	15
March	38·4	32·4	44·5	12·1	22·3	52·6	86	8·1	2·40	17
April	46·9	38·4	55·5	17·1	30·4	72·0	67	6·0	2·55	17
May	52·0	42·2	61·8	19·6	35·8	78·0	70	5·3	1·82	7
June	57·3	47·4	67·1	19·7	39·5	78·0	63	5·5	·81	11
July	64·2	54·2	74·2	20·0	46·5	87·5	70	5·2	2·41	8
August	61·5	52·0	71·0	19·0	44·1	81·8	73	5·4	2·22	10
Sept.	57·5	50·1	64·9	14·8	40·7	71·7	81	6·9	1·32	6
Oct.	49·7	42·7	56·7	14·0	31·1	71·4	87	7·3	2·08	16
Nov.	41·0	35·0	46·9	11·9	19·6	54·6	86	6·6	·80	8
Dec.	37·5	32·5	42·6	10·1	21·7	54·1	88	7·0	3·91	18
Year	48·2	40·8	55·5	14·7	17·8	87·5	79	6·5	22·57	147

TABLE IX. — *Climatological Observations taken at the* GAS WORKS, NEW BARNET. *Latitude:* 51° 39′ 5″ N. *Longitude:* 0° 10′ 15″ W. *Altitude:* 212 *feet. Observer:* T. H. MARTIN, Assoc. M. Inst. C.E.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	36·9	30·8	43·0	12·2	9·0	55·0	87	6·5	·70	13
Feb.	35·1	28·2	42·1	13·9	10·5	53·8	88	7·5	·87	7
March	39·0	31·0	47·0	16·0	21·1	57·0	89	7·5	2·73	18
April	46·9	34·8	59·0	24·2	22·0	75·0	75	4·3	2·48	16
May	52·5	38·9	66·0	27·1	26·9	84·1	77	4·0	1·12	6
June	58·4	45·2	71·7	26·5	32·0	83·0	72	5·3	·76	8
July	64·3	50·2	78·4	28·2	39·5	91·0	74	4·6	2·28	7
August	62·2	49·0	75·4	26·4	40·1	86·1	74	4·3	1·61	7
Sept.	57·2	46·0	68·4	22·4	33·1	77·5	85	6·1	1·38	6
Oct.	49·1	39·1	59·0	19·9	24·0	74·0	89	6·0	2·29	14
Nov.	40·3	32·2	48·5	16·3	14·0	56·1	85	5·5	·61	6
Dec.	37·4	30·7	44·0	13·3	18·0	56·8	87	6·4	3·59	12
Year	48·3	38·0	58·5	20·5	9·0	91·0	82	5·7	20·42	123

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two or three days were much warmer than the rest, and from the 4th the maximum temperatures were remarkably equable while the minimum varied very greatly; thus there was at St. Albans the following succession of minima: 9th 47°·3, 10th 36°·3; 18th 49°·8, 19th 39°·9; 21st 31°·5, 22nd 40°·6; 25th 40°·5, 26th 31°·5; 27th 31°·1, 28th 41°·4, 29th 50°·1; while on the same dates the maxima were: 57°·1, 56°·6; 56°·1, 57°·0; 51°·0, 51°·1; 52°·0, 52°·1; 55°·7, 54°·4, 54°·6; a mean variation from day to day on the selected days of 9°·3 in the minimum temperatures and of only 0°·5 in the maximum. As in September, there was rather less than the average duration of sunshine and the air was very calm. The most frequent direction of the wind was from the south-west and west.

NOVEMBER.—A cold month, with a rather dry atmosphere, a rather bright sky, and a very small rainfall on a small number of days. The low temperature was twice as much due to the coldness of the nights as it was to that of the days, the mean daily range being rather greater than usual. The temperature varied very greatly during the month; thus at St. Albans the *mean* temperatures of succeeding days when the four greatest changes occurred were: 7th 38°·5, 8th 46°·8; 13th 44°·1, 14th 36°·6; 17th 31°·8, 18th 40°·2, 19th 46°·5, 20th 50°·6; 21st 49°·4, 22nd 42°·6, 23rd 36°·6. There was rather more sunshine than usual, its duration being 2½ hours a day against a mean of 2 hours. Westerly winds greatly prevailed.

DECEMBER.—Rather cold, but within half a degree of the average temperature of the month, with an atmosphere of average humidity, a little brighter sky than usual, and a very heavy rainfall on the average number of days. The mean daily range of temperature was about the same as usual. The fortnight from the 15th to the 28th was much the coldest part of the month, and the only considerable changes in temperature were at the commencement and end of this cold period; at St. Albans the mean temperature was, on the 14th 38°·2 and 15th 30°·9; on the 28th 35°·8 and 29th 44°·2. Sunshine, although less than in any month but February, was about the average for the month, which is generally the least sunny one in the year. South-westerly and westerly winds very greatly prevailed. Snow fell on the 9th, 11th, 12th, 14th, 15th, 16th, 17th, 23rd, and 24th, on two of these occasions to the depth of two inches. This is the wettest December on record in Hertfordshire since 1881, except that of 1896 when the rainfall was practically the same.

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XVIII.

REPORT ON THE RAINFALL IN HERTFORDSHIRE IN THE YEAR 1901.

By JOHN HOPKINSON, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

THE alterations in our staff of observers for the year 1901 are less numerous than they were in the previous year, when there were six losses and five gains, the losses for last year being three and the gains four, giving an increase of one. No return has been received from the Union Workhouse, Royston, and two rainfall stations have been discontinued—The Limes, Northchurch, owing to the removal of the observer, Mr. Sutton; and Marden Hill, Tewin, owing to the death of the observer, Mr. Richard Hoare. The gains are The Chilterns, Hitchin; Danesbury, Welwyn; Hamels Park, Buntingford, a former station reinstated; and the Sewage Works, Hertford, for which we are indebted to the Engineer of the East London Waterworks. Danesbury, Welwyn, takes the place of Marden Hill, Tewin, leaving the number of stations in the Mimram river-basin the same as before; but each of the other alterations makes a difference in the number of gauges in the river-basin in which it has taken place.

These alterations result in the principal table containing the records of 45 stations, being the same number as in the year 1899. The number of perfect daily records received is 35. This has only once been exceeded, in 1898, when the number was 36.

Particulars of the 45 rainfall stations, and the monthly and total rainfall and number of days of rain in 1901, are given in Tables I and II, pp. 157–159.

A supplementary table (Table III, p. 160) gives ten other records of the total rainfall in the year. Two are records of additional gauges at Rothamsted, one is that of an additional gauge at Odsey, one is the return from Chipperfield omitted from the principal table for the same reason as in the previous year, and six are from 'British Rainfall, 1901.'

The mean rainfall in Hertfordshire in the year 1901 was 21·12 inches. This is 3·66 ins. below the average for the decade 1890–99, and 5·03 ins. below that for the 60 years 1840–99. The year was therefore one of small rainfall. The mean number of wet days in the year was 138, being 29 less than the average for the thirty years 1870–99, and 39 less than that for the previous year. The frequency of the rain was much less in proportion to the average than was the amount.

Droughts in 1901.—There was only one "absolute drought" (a period of more than 14 days without a measurable quantity of rain) and one "partial drought" (a period of more than 28 days with an average fall of less than 0·01 inch of rain per diem). The absolute drought was in May, and lasted for 15 days, May 10–24,

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at fourteen stations; for 15 days, May 11–25, at three stations; for 16 days, May 10–25, at two stations; for 18 days, May 11–28, at two stations; and for 19 days, May 10–28, at eleven stations. It thus occurred at 32 out of the 35 stations for which the daily records have been received. The partial drought was in May-June, and lasted for 33 days, May 10 to June 11, at twenty-four stations, with an average of 0·0065 in. of rain per diem, and for 40 days, May 10 to June 18, at nine of these stations, with an average of 0·0067 in. of rain per diem.

Distribution of the Rainfall throughout the Year.—Of the total rainfall of 21·12 inches, 10·77 inches fell during the six winter months and 10·35 inches during the six summer months. During the first quarter of the year 4·34 ins. fell, during the second quarter 4·60 ins., during the third quarter 5·75 ins., and during the fourth quarter 6·43 ins. During the Winter of 1900–1 (Dec. to Feb.) 5·01 ins. fell, during the Spring (March to May) 5·95 ins., during the Summer (June to August) 5·40 ins., and during the Autumn (Sept. to Nov.) 4·07 ins. January, June, and November were very dry months; February, May, and September were dry; August and October were rather dry; March, April, and July were rather wet; and December was very wet. The eight dry months averaged 1·29 inch each, and the four wet months 2·69 inches each.

The difference in each month from the mean for the 60 years 1840–99 was as follows:—Jan., — 1·41 in.; Feb., — 0·43; March, + 0·66; April, + 0·59; May, — 0·70; June, — 1·09; July, + 0·03; August, — 0·51; Sept., — 0·94; Oct., — 1·04; Nov., — 1·72; and Dec., + 1·63 in.

The absolute maximum falls in any one day in each month, and the stations recording them, were—Jan. 27, Rothamsted, Harpenden, 0·32 in.; Feb. 4, Colne Valley Water Works, Watford, 0·71 in.; March 7, Therfield Rectory, 0·72 in.; April 3, Moor Park, Rickmansworth, 0·82 in.; May 7, Gorhambury, St. Albans, 1·01 in.; June 30, Moor Park, 1·47 in.; July 12, London Orphan Asylum, Watford, 1·89 in.; August 26, Hamels Park, Buntingford, 0·82 in.; Sept. 16, Offside Cottage, Cowroast, 0·87 in.; Oct. 15, Great Gaddesden Vicarage, 0·84 in.; Nov. 13, Weston Park, Stevenage, 0·86 in.; Dec. 12, Rose Cottage, Berkhamsted, 1·48 in.

The day in each month on which a heavy fall of rain was most general over the county was—Jan. 19, Feb. 28, March 19, April 3, May 7, June 30, July 26, August 25, Sept. 16, Oct. 16, Nov. 13, Dec. 12; and in the year Nov. 13 and Dec. 12, each of these days being the wettest in the month at all stations, but Dec. 12 was a much wetter day than Nov. 13.

The average number of wet days in each month was as follows:—Jan., 14; Feb., 12; March, 18; April, 15; May, 7; June, 9; July, 8; August, 10; Sept., 7; Oct., 15; Nov., 8; Dec., 15.

The deviation from the mean for the 30 years 1870–99 was—Jan., — 1; Feb., — 1; March, + 5; April, + 2; May, — 5; June, — 3; July, — 6; August, — 4; Sept., — 6; Oct., — 1; Nov., — 8; Dec., — 1.

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TABLE I.—HERTFORDSHIRE RAINFALL STATIONS, 1901.

District.	STATION.	OBSERVER *or* AUTHORITY.	Diameter of Gauge.	Height of Gauge above Ground.	Height of Gauge above Sea-level.	
			ins.	ft. ins.	ft.	†
1.	*Royston—Melbourne Street	Joseph E. J. Phillips	8	0 11	201	T
,,	*Odsey	H. George Fordham	5	1 0	256	↑
2.	*Baldock—High Street	F. W. Langston Day	5	1 0	214	↑
3.	*Hitchin—Preston	R. de V. Pryor	8	2 6	480	↑
,,	,, The Firs	William Lucas	5	2 1	238	↑
,,	,, The Maples	William Hill	8	1 1	220	T
,,	* ,, The Chilterns	F. Ransom	5	0 9	300	↑
,,	* ,, High Down	Joseph Pollard	5	1 1	422	↑
4.	Tring—Pendley Manor	J. G. Williams	5	2 0	500	?
,,	,, Bulbourne	Gordon C. Thomas	5	2 3	401	
6.	Cowroast	Gordon C. Thomas	5	3 8	394	↑
,,	* ,, Offside Cottage	Richard Leah	5	1 6	420	
,,	*Berkhamsted—Fairhill	W. B. Hopkins	5	1 0	548	↑
,,	* ,, Rosebank	Edward Mawley	8	1 0	401	↑
,,	* ,, Rose Cottage	W. E. Milner	5	1 0	334	↑
7.	*Great Gaddesden Vicarage	Rev. W. T. T. Drake	8	1 0	427	↑
,,	*H. Hempstead—Apsley Mills	J. Dickinson & Co.	24	0 9	260	
8.	*Kensworth—The Grove	Miss S. Grace Jones	5	1 0	630	B
,,	*Harpenden—Rothamsted	J. A. Voelcker	5	0 9	420	T
,,	St. Albans—Gorhambury	W. Newberry	5	1 0	423	T
,,	* ,, Herts County Museum	John Hopkinson	5	1 0	386	T
,,	* ,, Bone Hill	H. J. T. Broadwood	5	1 0	336	↑
9.	* Elstree—Aldenham House	Edwin Beckett	10 sqr.	4 9	305	
10.	* Watford—Orphan Asylum	Dr. O. C. Cockrem	5	1 0	231	T
,,	* ,, Frogmore	Arthur P. Blathwayt	5	1 0	182	T
,,	,, Colne Val. W'r W'ks.	William Verini	5	1 6	220	
,,	*Rickmansworth—Moor Park	Lord Ebury	5	2 0	340	↑
12.	*Welwyn—Danesbury	Col. A. M. Blake, C.B.	8	0 11	201	
,,	* ,, Bridge House	B. Wilfred Thomas	5	0 6	228	?
,,	*Datchworth Rectory	Rev. Andrew Amos	5	1 0	386	T
13.	*Stevenage—Weston Park	M. R. Pryor	5	0 8	470	T
,,	*Bennington—Desmond Cot.	Miss M. C. Nihill	5	1 0	408	
,,	* ,, Bennington House	Rev. Dr. Parker	5	1 0	408	↑
14.	*Therfield Rectory	Rev. John G. Hale	5	4 0	510	↑
,,	*Throcking Rectory	Rev. C. W. Harvey	5	1 0	484	T
,,	Buntingford—Hamels Park	E. Wallis	5	1 0	400	T
15.	*Much Hadham	T. Woodham Mott	5	1 0	222	B
16.	Harlow—Gilston Park	William Cooper	8	0 6	175	T
17.	*Hertford—Bayfordbury	W. Clinton Baker	8	1 2	250	
,,	* ,, Sewage Works	W. B. Bryan	8	6 0	125	
,,	*Ware—Fanhams Hall	Miss V. M. Croft	8	1 0	235	T
,,	* ,, Red House	Joseph Francis	5	4 0	115	T
18.	*Broxbourne—Stafford House	G. J. Newbery	5	1 0	118	T
,,	*Northaw—Northacre	Rev. F. W. Poland	5	1 0		
,,	*New Barnet—Gas Works	T. H. Martin	8	0 9	212	

* Daily records received. † For explanation of these symbols see p. 33, ante.

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TABLE II.—RAINFALL IN

River Districts.			Stations.	Jan.	Feb.	Mar.
				in.	in.	ins.
OUSE	CAM	1. Rhee	Royston—Melbourne Street	·53	·93	2·55
			Odsey	·66	·95	2·23
	IVEL	2. Upper Ivel	Baldock—High Street	·60	·93	2·45
		3. Hiz	Hitchin—Preston	·85	1·14	2·31
			,, The Firs	·78	1·04	2·65
			,, The Maples	·70	·97	2·54
			,, The Chilterns	·83	1·10	2·40
			,, High Down	·70	·83	2·11
THAMES	THAME	4. Up. Thame	Tring—Pendley Manor	1·09	1·49	2·59
			,, Bulbourne	1·09	1·38	2·68
	COLNE	6. Bulbourne	Cowroast	1·01	1·46	2·38
			,, Offside Cottage	1·00	1·42	2·50
			Berkhamsted—Fairhill	·90	1·29	2·27
			,, Rosebank	1·13	1·44	2·64
			,, Rose Cottage	1·10	1·46	2·63
		7. Gade	Great Gaddesden Vicarage	·82	1·23	2·62
			Hemel Hempstead—Apsley Mills	1·14	1·42	2·91
		8. Ver	Kensworth—The Grove	1·30	1·21	2·46
			Harpenden—Rothamsted	1·02	1·19	2·39
			St. Albans—Gorhambury	·86	1·29	2·47
			,, Herts County Museum	·86	1·39	2·40
			,, Bone Hill	·84	1·38	2·25
		9. Up. Colne	Elstree—Aldenham House	·70	1·24	2·10
		10. Lo. Colne	Watford—London Orphan Asylum	·77	1·21	1·85
			,, Frogmore	·82	1·28	1·95
			,, Colne Valley Water Works	·81	1·54	1·92
			Rickmansworth—Moor Park	1·05	1·38	2·01
	LEA	12. Mimram	Welwyn—Danesbury	·85	1·33	2·31
			,, Bridge House	·79	1·34	2·42
			Datchworth Rectory	·76	1·17	1·92
		13. Beane	Stevenage—Weston Park	·68	1·27	2·18
			Bennington—Desmond Cottage	·81	1·36	2·05
			,, Bennington House	·66	1·08	1·74
		14. Rib	Therfield Rectory	·75	1·11	2·66
			Throcking Rectory	·47	1·17	1·99
			Buntingford—Hamels Park	·52	1·01	2·15
		15. Ash	Much Hadham	·73	1·34	2·32
		16. Stort	Harlow—Gilston Park	·72	1·19	2·65
		17. Upper Lea	Hertford—Bayfordbury	·67	1·58	2·06
			,, Sewage Works	·64	1·18	1·81
			Ware—Fanhams Hall	·76	1·02	2·26
			,, Red House	·56	1·12	2·01
		18. Lower Lea	Broxbourne—Stafford House	·65	1·19	2·15
			Northaw—Northacre	·63	·91	2·06
			New Barnet—Gas Works	·70	·87	2·73
Mean for the County				·81	1·22	2·31

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HERTFORDSHIRE IN 1901.

APL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR.	DAYS.
ins.	in.	in.	ins.	ins.	in.	ins.	in.	ins.	ins.	
2·41	·82	1·48	3·15	1·88	1·28	1·51	1·30	2·58	20·42	131
1·94	1·34	1·69	1·71	1·30	1·32	1·95	1·05	2·74	18·88	154
2·33	1·18	·82	1·99	1·57	1·52	1·28	1·00	3·22	18·89	124
2·34	1·32	1·07	1·64	1·82	·82	1·91	1·07	3·58	19·87	132
2·41	1·28	·95	2·13	1·61	1·39	1·81	1·13	3·50	20·68	144
2·26	1·20	·84	2·39	1·44	1·36	1·63	1·06	3·26	19·65	125
2·34	1·25	·93	2·29	1·44	1·20	1·51	·74	2·97	19·00	140
2·26	1·03	·97	3·21	1·65	1·22	1·78	·94	3·01	19·71	140
2·91	1·69	1·15	3·31	2·08	1·96	2·51	·87	4·34	25·99	158
2·52	1·53	·99	2·74	2·18	1·61	2·36	·87	4·10	24·05	162
2·90	1·74	1·15	2·63	2·07	1·90	2·65	·84	4·46	25·19	124
2·80	1·74	1·15	2·66	2·09	1·88	2·59	·89	4·38	25·10	154
2·51	1·59	·90	2·69	1·92	1·29	2·23	·80	4·24	22·63	138
2·46	1·70	·91	2·61	1·98	1·20	2·18	·78	4·63	23·66	142
2·35	1·72	·85	2·95	2·05	1·20	2·37	·76	4·63	24·07	143
2·73	1·70	1·00	3·03	2·03	1·12	2·46	·96	4·56	24·26	145
2·55	1·77	·59	2·78	2·19	1·17	2·24	·80	4·03	23·59	142
2·54	1·58	·89	2·09	2·01	1·46	2·81	·81	4·20	23·36	133
2·42	1·77	·81	2·32	1·94	1·25	1·90	·90	4·01	21·92	143
2·05	1·71	·89	2·13	2·07	1·36	2·15	·77	4·23	21·98	157
2·55	1·82	·81	2·41	2·22	1·32	2·08	·80	3·91	22·57	147
2·54	1·52	·73	2·46	2·21	1·36	2·02	·71	4·58	22·60	149
2·32	1·06	·72	2·66	1·54	·98	1·32	·52	3·32	18·48	121
2·28	·81	·94	3·00	1·98	1·34	1·91	·53	4·05	20·67	137
2·34	·84	1·16	1·44	2·07	1·68	1·55	·44	4·00	19·57	132
2·25	·79	1·07	1·38	1·83	1·15	1·76	·36	3·42	18·28	134
2·76	·87	1·87	·92	2·16	1·41	2·17	·67	4·36	21·63	148
2·20	1·18	1·01	4·03	2·20	1·04	1·56	·96	3·53	22·20	124
2·05	1·16	1·09	3·63	1·91	1·23	1·61	1·04	3·87	22·14	151
1·85	1·16	·96	3·87	2·15	1·25	1·27	·80	3·33	20·49	119
2·58	1·37	1·01	2·55	1·59	1·14	1·49	1·22	3·16	20·24	142
1·91	1·44	1·03	2·91	2·25	·98	1·18	1·04	3·09	20·05	152
1·89	1·15	·82	3·62	1·95	1·07	1·54	·87	3·14	19·53	165
2·42	1·12	1·52	2·68	1·56	1·25	1·51	1·05	2·93	20·56	154
2·38	1·30	·67	2·74	2·47	1·18	1·53	·92	2·91	19·73	134
2·07	1·64	·66	3·56	2·49	1·52	1·53	·87	3·22	21·24	
2·00	1·58	·92	1·43	2·39	1·13	2·43	·94	3·43	20·64	119
1·95	1·50	·71	2·30	1·70	1·67	2·28	1·07	3·53	21·27	112
1·68	1·44	·82	2·27	1·86	1·00	1·65	·73	3·68	19·44	142
1·55	1·26	·85	1·53	1·68	1·31	1·54	·60	3·58	17·53	120
1·92	1·42	·93	1·91	2·13	1·31	2·63	·65	3·56	20·50	132
1·90	1·19	·89	1·99	1·82	1·15	1·85	·64	3·35	18·47	124
1·82	1·30	·66	1·58	1·98	1·43	2·13	·66	3·39	18·94	135
2·11	1·64	·76	3·50	1·68	1·10	1·73	·66	3·29	20·07	131
2·48	1·12	·76	2·28	1·61	1·38	2·29	·61	3·59	20·42	123
2·28	1·36	·96	2·51	1·93	1·31	1·92	·84	3·67	21·12	138

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TABLE III.—SUPPLEMENTARY TO TABLES I AND II.

District.	Station.	Observer.	Gauge. Diameter.	Gauge. Height above Sea.	Rainfall.	Days.
			ins.	feet.	ins.	
1.	Royston—Un. Workhouse	H. Warren	5	217	20·92	130
,,	Odsey (2nd gauge)	H. G. Fordham	5	256 ↑	18·51	154
4.	Tring—Elm House	E. J. Le Quesne	5	460	22·81	142
,,	,, Wigginton	Rev. H. J. Burrell	5	710 ↑	24·93	132
7.	Chipperfield	A. W. Rivington	5	407 T	16·36	94
8.	Harpenden—Rothamsted	J. A. Voelcker	8	420 T	21·09	129
,,	,, ,,	,,	72 × 87	420 T	23·15	151
10.	Watford—St. Albans Rd.	H. Ruddle	5	240	21·04	
18.	Hoddesdon—Feilde's Weir	W. B. Bryan		95	17·53	
,,	Barnet—Hadley	H. E. Freir	5	340	21·85	113

Distribution of the Rainfall throughout the County.—The next table (Table IV) gives the mean fall in each month and in the year in each of the five river-districts represented, and in the two main hydrographical divisions of the county, the catchment-basins of the Great Ouse and of the Thames, and also the difference in the year from the mean for the 20 years 1880–99.

TABLE IV.—RAINFALL IN THE RIVER-DISTRICTS.

MONTHS.	CAM.	IVEL.	THAME.	COLNE.	LEA.	OUSE.	THAMES.
	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Jan.	·60	·74	1·09	·95	·69	·71	·83
Feb.	·94	1·00	1·44	1·34	1·18	·99	1·27
March	2·39	2·41	2·63	2·34	2·19	2·40	2·28
April	2·17	2·32	2·72	2·49	2·04	2·29	2·28
May	1·08	1·21	1·61	1·45	1·33	1·18	1·40
June	1·59	·93	1·07	·97	·89	1·09	·94
July	2·43	2·28	3·02	2·36	2·69	2·31	2·56
August	1·59	1·59	2·13	2·02	1·97	1·59	2·00
Sept.	1·30	1·25	1·79	1·35	1·23	1·26	1·32
October	1·73	1·65	2·43	2·14	1·76	1·67	1·97
Nov.	1·17	·99	·87	·73	·85	1·04	·79
Dec.	2·66	3·26	4·22	4·18	3·36	3·11	3·79
Year	19·65	19·63	25·02	22·34	20·18	19·64	21·43
Diff. from 1880–99	−3·18	−4·81	−3·25	−5·19	−4·57	−4·21	−4·75

The mean fall in each of the minor river-basins or sub-districts represented was as follows:—(*Cam*) Rhee, 19·65 ins.; (*Ivel*) Upper Ivel, 18·89 ins.; Hiz, 19·63 ins.; (*Thame*) Upper Thame, 25·02 ins.; (*Colne*) Bulbourne, 23·73 ins.; Gade, 23·92 ins.; Ver, 22·45 ins.; Upper Colne, 18·48 ins.; Lower Colne, 20·04 ins.; (*Lea*) Mimram, 21·61 ins.; Beane, 19·94 ins.; Rib, 20·51 ins.; Ash, 20·64 ins.; Stort, 21·27 ins.; Upper Lea, 18·99 ins.; Lower Lea, 19·81 ins.

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The rainfall is thus seen to have been much the greatest in the extreme west of the county (Thame district), gradually less towards the centre, less still as the east is approached and in the north, and greater again in the extreme east, though much less there than in the western and west-central area. The rainfall exceeded one inch in 24 hours on six occasions during the year, and there are 56 records of such falls in the aggregate at all stations. These were most frequent in proportion to the number of stations in the Thame district and least frequent in the Ouse district, and they were about equal in the districts of the Colne and the Lea. On May 7 there was a heavy fall in the Colne district culminating at St. Albans, where it reached about an inch at the three stations. On June 30 nearly an inch and a half fell at Moor Park. On July 12 occurred the great Watford storm and flood, when more rain fell in an hour over part of the town than has ever before been recorded for that period at any rainfall-station in Hertfordshire, though very little fell at Bushey, and none whatever in the extreme east and south-east of the county: in the lower part of the Bulbourne, the Gade, and parts of the Lower Colne and Mimram districts the fall exceeded an inch. On July 25 and 26 there was heavy rain over the Ouse, the Lea, the Thame, and the Ver districts, varying from an inch to over an inch and a half on one or other day. And lastly on December 12 the fall was at least an inch at nearly every station in the county, the Bulbourne district receiving the largest amount and the Gade but little less.

The total yearly fall ranged from 17·53 inches at the Hertford Sewage Works to 25·99 inches at Pendley Manor, Tring; and the total monthly fall from 0·36 inch at the Colne Valley Water Works, Watford, in November, to 4·63 inches at Rosebank, Berkhamsted, and Rose Cottage, Berkhamsted, in December. The greatest fall in any one day was 1·89 inch at the London Orphan Asylum, Watford (1·98 inch at 107, St. Albans Road, Watford, a supplementary station), on the 12th of July.

Distribution of the Rainfall in each Month.—The nomenclature used in the following account of the chief falls of rain is the same as in my previous reports, falls of at least ½ inch being styled *considerable*, ¾ inch *very considerable*, 1 inch *great*, 1¼ inch *very great*, 1½ inch *heavy*, and 1¾ inch *very heavy*. As in the previous year, there was no *excessive* fall (2 inches). Only the thirty-five complete returns of the daily rainfall are thus analysed, except that falls of at least one inch which were the heaviest in the month are given for all stations. The wettest days in each month are given for all the forty-five stations.

JANUARY.—A month of very small rainfall, but with rain or snow on about the average number of days. Snow fell only up to the 8th and after the 26th, and it was very small in amount. There was no *considerable* fall either as rain or snow. The 8th was the wettest day at 3 stations, the 9th at 5, the 19th at 18, the 27th at 13, and the 28th at 2.

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FEBRUARY.—Rainfall small and mostly in the form of snow up to the last week, the rain or snow falling on about the average number of days. On the 4th the fall, which occurred as snow, was *considerable* at one station (Bayfordbury). This was the wettest day at 16 stations, the 5th was the wettest at 2, the 6th at one station, the 26th at 2 stations, and the 28th at 24.

MARCH.—A rather wet and stormy month with much snow and hail and a large number of wet days. On the 2nd the fall, during a thunderstorm, was *considerable* at one station, on the 7th at 2 stations, on the 19th at 2, and on the 30th, again during a thunderstorm, at one station. The 2nd was the wettest day at 6 stations, the 6th at one station, the 7th at 9 stations, the 19th at 20, and the 30th at 9.

APRIL.—Another rather wet month with frequent hail but no snow, and with rather more than the average number of wet days. Only the first half of the month was wet, rain falling on nearly every day to the 16th, and afterwards only on 26th at a few stations and on 27th at nearly all. On the 3rd the fall was *considerable* at 22 stations and *very considerable* at 3 (in the Colne district). This was the wettest day at 43 stations, and the 10th was the wettest at 2. There was a thunderstorm on the 2nd with but little rain.

MAY.—A rather dry month with rain on very few days, several thunderstorms, and occasional falls of hail. Nearly all the rain fell during the four days 6th to 9th and on 29th and 30th. On the 7th the fall was *considerable* at 16 stations, *very considerable* at 8, and *great* at Gorhambury, St. Albans (1·01 in.); and on the 9th it was *considerable* at 2 stations, both in the Lea district. The 7th was the wettest day at 38 stations, the 8th at 2, and the 9th at 5. The drought in this month has already been mentioned.

JUNE.—Rainfall very small and on a small number of days. The first eleven days were without rain at most stations. On the 12th the fall was *considerable* at 2 stations, and on the 30th it was *considerable* at 4 and *very great* at Moor Park, Rickmansworth (1·47 in.). This fall is remarkable as having been the heaviest in a small area in the south-west of the county and in the Ouse district on the north. The 12th was the wettest day at 4 stations, the 21st at 2, the 24th at one station, and the 30th at 38 stations.

JULY.—Rather wet, but with rain on a very small number of days, that registered being chiefly the result of heavy falls in thunderstorms. On the 2nd the fall was *considerable* at 2 stations and on the 6th at one station. On the 12th it was *considerable* at 7 stations, *great* at Apsley Mills, Hemel Hempstead (1·01 in.), Bridge House, Welwyn (1·10 in.), and Rosebank, Berkhamsted (1·22 in.), *very great* at Great Gaddesden (1·30 in.), Danesbury, Welwyn (1·45 in.), and Rose Cottage, Berkhamsted (1·48 in.), *heavy* at Callipers, Chipperfield (1·68 in.), and *very heavy* at the London Orphan Asylum, Watford (1·89 in.), and 107, St. Albans Road, Watford (1·98 in.). At these two stations all but a tenth of an inch of the amount fell in a few minutes over an hour, the

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rain commencing at 4 p.m., and in an action at Watford arising out of damage done by flooding (in which the writer gave evidence as to the rainfall) it was admitted by the party in the action whose interest it was to show that the fall was not exceptional in intensity that as much as 1·88 in. fell at another station in the town in three-quarters of an hour, giving an intensity at the rate of over two and a half inches per hour in that period, which is unprecedented in our records for any part of the county. It is a curious coincidence that the greatest fall recorded in Hertfordshire in any one day was on the 12th of July, 1889 (3·91 ins. at Marden Hill, Tewin), and that the greatest intensity of rainfall recorded in England as maintained for so long a period as an hour and a quarter was on the 12th July, 1900, when 3·75 ins. of rain fell in that time at Brook Street, Ilkley, being at the rate of 3 inches per hour. The fall at Watford occurred in a thunderstorm and was accompanied by hail; and similar heavy and usually local falls occurred in the county in the last week of this month. On the 25th the fall was *considerable* at 7 stations, *great* at Melbourn Street, Royston (1·23 in.), and Bennington House, Stevenage (1·46 in.), and *heavy* at Datchworth Rectory (1·68 in.) and Hamels Park, Buntingford (1·68 in.). On the 26th the fall was *considerable* at 16 stations, *very considerable* at 3, *great* at The Maples, Hitchin (1·00 in.), The Chilterns, Hitchin (1·02 in.), Weston Park, Stevenage (1·11 in.), Bulbourne (1·16 in.), and Bennington House (1·23 in.), *very great* at Desmond Cottage, Bennington (1·29 in.), and *heavy* at High Down, Hitchin (1·61 in.), and Pendley Manor, Tring (1·64 in.). On the 27th the fall was *considerable* at 2 stations and *very considerable* at 4; and on the 28th it was *considerable* at 3 stations. The 12th was the wettest day at 12 stations, the 25th at 8, the 26th at 20, and the 27th at 5.

August.—A rather dry month, with rain on a small number of days, most of it falling in the middle of the month and during the last week. There were a few slight thunderstorms; one on the 26th with hail. On the 25th the fall was *considerable* at 10 stations and *very considerable* at one station, on the 26th it was *considerable* at 5 stations, and on the 27th at 3. The 14th was the wettest day at 3 stations, the 15th at one station, the 25th at 25 stations, the 26th at 6, the 27th at 9, and the 14th and 27th were the wettest at one station.

September.—A dry month, with rain on a very small number of days, chiefly in the middle of the month, when there were a few slight thunderstorms. On the 16th the fall was *considerable* at 17 stations and *very considerable* at 2; on the 17th it was *considerable* at 2 stations, and on the 20th at 2 (so far apart as Cowroast and Broxbourne). The 16th was the wettest day at 29 stations, the 17th at 2, and the 20th at 4.

October.—Rather dry, with nearly the average number of wet days. There were a few slight thunderstorms during the first week. On the 2nd the fall was *considerable* at 3 stations; on the 16th it was *considerable* at 8 and *very considerable* at 2; and on the

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18th it was *considerable* at one station (Offside Cottage, Cowroast) and *very considerable* at one (The Grove, Kensworth). The 1st was the wettest day at one station, the 2nd at 4 stations, the 6th at 2, the 16th at 22, the 18th at 14, and the 16th and 18th were the wettest at 2 stations.

NOVEMBER.—Very dry, and with very few wet days, being only half the average number. The only very wet day was the 13th, when the fall, which was partly rain and partly snow, was *considerable* at 13 stations and *very considerable* at 4. This was the wettest day at all stations.

DECEMBER.—The only very wet month in the year, with rain on scarcely the average number of days, three very wet days fully accounting for the large amount of the fall. Much of the precipitation was in the form of snow, but during the last week rain only fell. By far the wettest day in the month, and generally over the county in the year, was the 12th, when the fall, chiefly as snow, was at least *very considerable* at all stations. It was *great* at Much Hadham (1·00), Gilston Park (1·00), Northaw (1·00), New Barnet (1·01), Chipperfield (1·02), Kensworth (1·02), Bone Hill, St. Albans (1·02), Red House, Ware (1·02), Odsey (1·03), Danesbury, Welwyn (1·04), Weston Park (1·04), Bennington House (1·04), Hamels Park (1·04), Fanhams Hall, Ware (1·04), Datchworth Rectory (1·07), The Firs, Hitchin (1·10), the County Museum, St. Albans (1·10), the Sewage Works, Hertford (1·10), Bridge House, Welwyn (1·11), Frogmore, Watford (1·13), Pendley Manor, Tring (1·14), Rothamsted, Harpenden (1·15), Gorhambury, St. Albans (1·15), Bayfordbury, Hertford (1·16), Bulbourne (1·17), Preston, Hitchin (1·19), Great Gaddesden (1·20), Apsley Mills (1·20), and Moor Park (1·23); and *very great* at Cowroast (1·28), Offside Cottage, Cowroast (1·38), Rosebank, Berkhamsted (1·40), and Rose Cottage, Berkhamsted (1·48). On the 24th the fall, partly as snow, was *considerable* at 30 stations and *very considerable* at 4. And on the 28th it was *considerable* at 8 stations and *very considerable* at one station (The Grove, Kensworth).

Comparison with the Rainfall of the Adjoining Counties.—The result of a comparison of the rainfall in Hertfordshire with that of the adjoining counties is very similar to that for the years 1899 and 1900, our county having an excess last year of 11·8 per cent. The mean rainfall in the year at the same stations as in the previous year (one to every 40 square miles in each county), except that in Beds one station has had to be substituted for another discontinued last year, was as follows:—Cambridgeshire (21 stations), 17·55 ins.; Bedfordshire (12 stations), 20·05 ins.; Buckinghamshire (18 stations), 20·40 ins.; Middlesex (7 stations), 20·11 ins.; and Essex (33 stations), 18·23 ins.; the mean for the whole of the 91 stations being 18·89 ins. This gives an excess in Hertfordshire of about 2¼ inches, and a mean excess for the three years of about 2½ inches per annum.

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XIX.

NOTES ON LEPIDOPTERA OBSERVED IN HERTFORDSHIRE IN THE YEAR 1901.

By A. E. Gibbs, F.L.S., F.R.H.S.

Read at Watford, 25th March, 1902.

In presenting my report on the Lepidoptera observed in Hertfordshire during the year 1901 I have pleasure in stating that I have eight species to add to our county list. On the other hand three species have to be removed from it. The old records of the occurrence of *Nemeobius lucina* and *Scoria dealbata* on Berkhamsted Common have been shown to be erroneous, but as *N. lucina* has been taken near Tring, *S. dealbata* only disappears. By the error of a copyist some records relating to *Cilix glaucata* were assigned to a rare and local species, *Drepana harpagula*, which also goes. The third species to be removed is *Lozopera francillana*, the specimen having been wrongly determined. This tortrix ought to occur in Hertfordshire, and should be looked for amongst *Daucus carota* in July and August.

The census therefore now stands as follows :—

	Species.
Recorded in the 'Victoria History of Hertfordshire' .	1138
To be removed	3
	1135
To be added	8
Total number now on record	1143

The new records of the year are the following :—

1. *Cymatophora octogesima*, Hb. (*ocularis*, Gn.). — This rather local insect is a welcome addition to our county list. It has been captured during the past year in two widely-separated localities, namely, near St. Albans by Miss Alice Dickinson on July 9th, and at Waltham Cross by Mr. W. C. Boyd. Both specimens were taken at sugar.

2. *Aporophyla lutulenta*.—The Rev. Gilbert H. Raynor, Rector of Hazeleigh, Essex, captured a fine male of this species at Weston Vicarage in September, when working for *Sphinx convolvuli*. The specimen, which Mr. Raynor has been kind enough to give to me, was caught at dusk settled on a flower of *Nicotina affinis*. This is another local species; its occurrence in Hertfordshire is very interesting, and Mr. Raynor's good fortune will probably induce local entomologists to work for it.

3. *Ennychia octomaculata*.—Amongst a number of small moths taken near St. Albans by Miss Alice Dickinson is this pretty little insect, which is of rather local occurrence in England.

4. *Spilodes palealis*.—On July 18th Mr. Philip J. Barraud took a specimen of the straw-pearl at light. This is a species which

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is apparently establishing itself in new localities, and I am glad to hear that it has now reached Hertfordshire. I took it last summer at Felixstowe on the Suffolk coast, but that is, I believe, one of its old localities. The larvæ feed on the wild carrot and other umbelliferous plants.

5. *Orobena extimalis.*—Mr. A. T. Goodson, of Tring, took a specimen of this species amongst other moths at dusk on June 28th in a field of vetches, etc., of rank growth. In an adjoining field Mr. Goodson was, last year, fortunate enough to take *Spilodes sticticalis*. The capture of *O. extimalis* is, I think, the most interesting record of the year, for, unlike most of our other new records, which are of species increasing in the area of their occurrence, *extimalis* is apparently one of our dying-out species. I reported the capture to Mr. Charles E. Barrett, F.E.S., one of our veteran entomologists, and the author of a very valuable and splendidly illustrated work on British Lepidoptera, which will doubtless be the standard authority on the subject for a long time to come, and he informs me that Cambridgeshire has been the home of *O. extimalis*, but that it has been very scarce for years there and elsewhere. It is hard to say why it is disappearing, for an insect whose larvæ feed on that very abundant cornfield plant the charlock ought to experience no difficulty in continuing its existence.

6. *Schœnobius mucronellus.*—A female of this species, whose larvæ feed in the stems of reeds, was taken at Watford by Mr. Vernon P. Kitchin, of The Priory, Langley Road.

7. *Homœosoma sinuella.*—A specimen of this species was captured in the goods-yard at Theobald's Grove Station, near Waltham Cross, by Mr. W. C. Boyd. I believe this is a species which has lately shown a decided inclination to spread inland.

8. *Homœosoma nebulella.*—This species has occurred both at St. Albans and Watford. On July 6th Mr. Arthur Cottam took a series amongst ragwort at Whippendell, and I also took it at light at my study window. The specimens were submitted to Mr. Barrett, who expressed surprise at its being taken in Herts. Mr. Cottam remarks that it is a difficult insect to get in good condition, as, though easily caught, it is so wild in the net that it soon ruins itself.

Having mentioned the species which we are able to add to our insect fauna, I now turn to the work done by the various observers in their particular districts. From most quarters I have received reports of a good season having been experienced, though Mr. Boyd hardly speaks so favourably of 1901 from the point of view of a working entomologist. At St. Albans I captured a number of species new to the district, most of my work having been done in the grounds of my new residence, where the vicinity of the river Ver, and the old monks' fish-pond in the neighbouring grounds of the Manor House, doubtless account for the capture of several insects which love the water or whose larvæ feed on aquatic plants.

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Perhaps the most interesting thing to be recorded with regard to the butterflies is the fact that the holly-blue (*Lycæna argiolus*) is becoming much more common with us than formerly, at any rate so far as the St. Albans district is concerned. It was taken in some abundance by Miss Alice Dickinson, Mr. A. Lewis, and myself, both the May and August broods being noted. The chalk-hill blue (*L. corydon*) was to be found in the lucerne-field near St. Albans in which it was discovered by Miss Dickinson last year. Mr. A. Cottam took both broods of *Lycæna adonis* (*bellargus*) at Aldbury. I am glad to learn from Miss Dickinson that she has found the white-letter hair-streak (*Thecla w-album*) to be plentiful, and that she captured specimens at both lucerne and blackberry blossoms. *Colias hyale* again made its appearance in the county in limited numbers. On June 6th Mr. Cottam saw two specimens on Aldbury Downs. He did not take them, as he hoped for the second brood, but in the Autumn he saw only one at the same place, and none elsewhere in the neighbourhood. Miss Dickinson and Mr. Lewis saw this insect near St. Albans. *C. edusa* is not reported.

With regard to the Sphingidæ or hawk-moths, the most noticeable feature was the comparative abundance of the convolvulus hawk-moth (*Sphinx convolvuli*), which is reported by Mr. W. C. Boyd from Waltham Cross, by the Rev. G. H. Raynor, M.A., at Weston Vicarage, by Mr. P. J. Barraud at Bushey Heath, by Mr. Cottam at Watford, and by myself at St. Albans. At the latter place the small elephant hawk-moth (*Chærocampa porcellus*) was taken, a specimen from a garden near the Camp being sent to Miss Dickinson, and one from Beaconsfield Road coming into my possession. A full-fed larva of the large elephant hawk-moth (*C. elpenor*) was taken by Mr. R. Angel in his garden in George Street, St. Albans. It had evidently fed on vine-leaves, and it pupated directly it came into my possession.

Miss Dickinson reports that the caterpillars of the death's head hawk-moth were rather plentiful in potato-fields in the neighbourhood, but she heard of them too late to secure them, though on October 4th and 22nd specimens from near Wheathampstead were sent to her, one of which was injured by the plough and died. Many of these interesting larvæ appear to have been destroyed as worthless "grubs." One or two specimens of the privet hawk-moth (*Sphinx ligustri*) were brought to me, and I took a newly emerged imago of the lime hawk-moth (*Smerinthus tiliæ*) in a yard in the centre of St. Albans. Mr. A. Cottam is the only entomologist reporting the presence of the poplar hawk-moth (*S. populi*), one of which came to light at his window on July 6th. Mr. Barraud reports that a few humming-bird hawk-moths (*Macroglossa stellatarum*) were seen at Bushey Heath.

I spread the first sugar of the season in my own meadow at St. Albans on May 14th, and on that evening and for some little time afterwards I took only hybernated specimens of the heraldmoth (*Gonoptera libatrix*). In September by this means I secured a good series of *Polia flavicincta* on the same trees, while the large red underwing (*Catocala nupta*) was exceptionally common in all

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spots at which I worked, and the same remark applies to *Mania maura*, generally known as the "Old Lady Moth." With regard to the latter it is worth mention that a moth of this species, having found a patch of sugar, will visit it night after night for some little time, a fact especially noticed this year both by Mr. Arthur Lewis and myself. Perhaps my best capture at sugar was *Agrotis ravida*, which is new to our St. Albans list. Light, however, proved the most attractive bait. At my study window at Kitchener's Meads and also in my moth-trap I took a series of interesting insects such as *Pterostoma palpina*, *Lophopteryx camelina*, *Melanthia ocellata*, *Eucosmia certata*, *Anaitis plagiata*, *Phibalopteryx vitalbata* (both Spring and Autumn broods), *Bapta taminata*, *Zonosoma porata*, *Hectus sylvanus*, *Anchocelis lunosa* (very abundant), *Xanthia gilvago* (not so plentiful as in 1900), *Pœcilocampa populi*, *Cheimatobia brumata*, and, to finish up the year on December 30th, my first record for St. Albans of *Cheimatobia boreata*. Two of the pug-moths were common, viz. *Eupithecia vulgata* and *E. subnotata*, the latter especially so, while *E. centaureata* and *E. linariata* were not scarce.

My best capture at dusk was *Luperina cespitis*, which I secured for the first time in St. Albans on September 3rd, in my meadow.

Among the micros taken by myself may be mentioned: Pyralides—*Rivula sericealis*, *Hypena rostralis*, *Scoparia cembræ*, *S. mercurella*, *Botys hyalinalis*, *Ebulea verbascalis*, *E. sambucalis*, *Paraponyx stratiotata*, *Hydrocampa nymphæata*, *Crambus pascuellus*, *C. perlellus*, *C. geniculeus*, *Homœosoma nimbella*, *H. nebulella*, and *Rhodophæa consociella*. Tortrices—*Rhacodia caudana* and *Leptogramma literana*, both at Bricket Wood, and *Conchylis smeathmanniana* at St. Albans. Tinea—*Butalis chenopodiella*.

Mr. Arthur Lewis records an interesting instance of "assembling." A female lappet which emerged in a crippled condition in his breeding-cage attracted no less than six fine males to his study. His other captures include *Spilosoma mendica*, *Tapinostola arundinis*, *Dipterygia scabriuscula* (very abundant), *Miana literosa*, *Noctua stigmatica*, *Triphæna fimbria*, *T. interjecta* (in some numbers), *Orthosia upsilon*, *Calymnia diffinis*, *C. affinis*, *Hecatera serena* (abundant), *Asteroscopus nubeculosa*, *Gonoptera libatrix* (one remarkably bright specimen).

Miss Alice Dickinson's capture of *Cymatophora ocularis* at sugar has already been referred to. She reports that she took several specimens of *Anticlea badiata* at sallow from 15th to 20th April. Among her noteworthy captures at sugar were such comparatively rare insects as *Xanthia aurago*, *Cirrhædia xerampelina*, *Calocampa vetusta*, and *Triphæna fimbria*. She also secured *Scotosia rhamnata* and *Epione apiciaria*. She has been good enough to send to me a box of micros captured in the neighbourhood, including *Botys ruralis*, *B. hyalinalis*, *Eurrhypara urticata*, *Ebulea sambucalis*, *Ennychia octomaculata*, *Pyralis costalis*, *Pyrausta purpuralis*, and *P. ostrinalis*. On the railway banks near Wheathampstead Miss Dickinson took *Heliothus arbuti* and *Euchlydia mi*. She is to be congratulated not only upon adding two species to our list, but also upon securing a number of very uncommon insects.

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Mr. Arthur Cottam, of Elderscroft, Watford, is, as usual, able to report the occurrence of some interesting species. Besides those already mentioned, Mr. Cottam secured in Whippendell on July 6th a specimen of *Macraria liturata*, an insect which has only been recorded from two other Hertfordshire localities—Sandridge and Haileybury. On the same occasion he caught a fine *Boarmia roboraria*, the great oak beauty, the only previous record for this insect being Haileybury, where three have been taken at light. He also beat out three *Metrocampa margaritaria*, but only secured one, the others flying straight up in the air and settling on the tops of the trees. On the evening of the same day *Abraxas ulmata* and *Avena flexula* came to light, and on the 20th two specimens of *Cosmia pyrolina*.

Mr. Philip J. Barraud, of Bushey Heath, has been good enough to send to me a list of the species which he captured at "light" at Bushey Heath in 1901, and this I give as an appendix at the end of my Report. He tells me that during the year he noted about 240 different species of Lepidoptera within a short distance of his residence. The majority of his captures were made with a light-trap, which he constructed to fit one of the upper windows of the house. Of these, in addition to *Spilodes palealis*, the species which he had added to our county list, the most remarkable are the light-feathered rustic (*Agrotis cinerea*), the true-lover's knot (*A. porphyrea*), the monk's-hood (*Plusia moneta*), of which four came to light and four were taken at dusk, the lunar-spotted pinion (*Calymnia pyralina*), which was fairly plentiful, and a brown aberration of *Spilosoma menthastri*, the white ermine. Mr. Barraud did not find sallow-bloom or ivy to yield anything of note, nor, judging from the list which he has sent me, was he more successful with "sugar."

Mr. A. T. Goodson, of Tring, has bred *Notodonta dictæa* from larvæ taken from the poplar-trees at the Tring Museum. *Asphalia diluta* was captured at sugar in Wick Wood, *Phorodesma pustulata*, Hufn. (*P. bajularia*, Schiff.), being taken in the same locality, but on the outskirts of the wood, where Mr. Goodson disturbed it when beating for larvæ in mid-afternoon on July 7th. Near Wick Wood, too, *Eucosmia undulata* was captured, flying about a foot from the ground, a second specimen being taken by Mr. W. H. Smith, of Tring, in much the same manner, flying in the daytime in Brown's Lane. Mr. Goodson was also fortunate enough to find the larvæ of *Pygæra pigra* on sallow in Brown's Lane.

Amongst the insects captured during the year by Mr. W. C. Boyd, of The Grange, Waltham Cross, who is an enthusiastic worker among the micros, may be mentioned the pretty little *Crambus pinellus*, which occurred twice. In Broxbourne Woods he secured *Grapholitha nigromaculana*, *Pædisca solandriana*, and *Gelechia bifractella*, three species which previously have only been recorded from Sandridge; the last-named he describes as being common. Mr. Boyd also reports the occurrence of a worn specimen of *Plusia moneta*.

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I am pleased to be able to record a number of species from Weston, near Stevenage, a locality which, so far as our records go, has not been previously worked. In September the Rev. G. H. Raynor, of Hazeleigh, Essex, spent three days at Weston Vicarage, and he has kindly furnished me with a list of the species of Lepidoptera he observed during that time. It is as follows:—

RHOPALOCERA: *Pieris rapæ*, *Vanessa atalanta*, *Cœnonympha pamphilus*, *Lycæna icarus*, *L. argiolus* (larvæ). HETEROCERA: *Sphinx convolvuli*, *Macroglossa stellatarum*, *Spilosoma lubricipeda* (larvæ), *Cossus ligniperda* (larvæ), *Porthesia similis* (larvæ), *Cilix glaucata* (larvæ), *Lophopteryx camelina* (larvæ), *Phalera bucephala* (larvæ), *Agrotis suffusa*, *Noctua c-nigrum*, *Triphæna comes*, *Xanthia fulvago*, *Aporophyla lutulenta*, *Plusia gamma*, *Uropteryx sambucaria* (larvæ), *Rumia luteolata* (larvæ), *Metrocampa margaritaria* (larvæ), *Selenia bilunaria* (larvæ), *Geometra vernaria* (larvæ), *Zonosoma linearia* (larvæ), *Ligdia adustata* (larvæ), *Melanippe fluctuata*, *Phibalapteryx tersata* (larvæ), *Cidaria truncata*.

LIST OF LEPIDOPTERA TAKEN AT LIGHT AT BUSHEY HEATH DURING 1901 BY MR. PHILIP J. BARRAUD.

SPHINGES
- Sphinx ligustri
- Smerinthus ocellatus

BOMBYCES
- Hylophila bicolorana
- Nola cucullatella
- Lithosia griseola
- ,, lurideola
- Euchelia jacobeæ
- Arctia caja
- Spilosoma lubricipeda
- ,, menthastri
- ,, ,, brown aberration
- Porthesia similis
- Dasychira pudibunda
- Trichiura cratægi
- Bombyx neustria
- Odonestis potatoria
- Drepana falcula
- ,, binaria
- Cilix spinula
- Pterostoma palpina
- Lophopteryx camelina
- Phalera bucephala
- Pygæra curtula
- Thyatira derasa

NOCTUÆ
- Bryophila perla
- Diloba cæruleocephala
- Leucania conigera
- ,, lithargyria
- ,, comma
- ,, impura
- ,, pallens
- Gortyna ochracea
- Hydræcia nictitans
- Hydræcia micacea
- Axylia putris
- Xylophasia lithoxylea
- ,, monoglypha
- Dipterygia scabriuscula
- Neuronia popularis
- Cerigo matura
- Luperina testacea
- ,, cespitis
- Mamestra brassicæ
- ,, persicariæ
- Apamea basilinea
- ,, gemina
- ,, unanimis
- ,, ophiogramma
- ,, oculea
- Miana strigilis
- ,, arcuosa
- Grammesia trilinea
- Caradrina morpheus
- ,, alsines
- ,, cubicularis
- Rusina tenebrosa
- Agrotis puta
- ,, suffusa
- ,, segetum
- ,, exclamationis
- ,, cinerea
- ,, porphyrea
- Noctua augur
- ,, plecta
- ,, c-nigrum
- ,, triangulum
- ,, festiva
- ,, baja
- ,, xanthographa

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Triphæna janthina
,, comes (orbona)
,, pronuba
Mania typica
Pachnobia rubricosa
Tæniocampa gothica
,, incerta
,, stabilis
Orthosia lota
,, macilenta
Anchocelis pistacina
,, lunosa
Cerastis vaccinii
,, spadicea
Xanthia citrago
,, fulvago
,, flavago
,, gilvago
Calymnia trapezina
,, pyralina
,, diffinis
,, affinis
Dianthecia capsincola
Hecatera serena
Meselia oxyacanthæ
Euplexia lucipara
Phlogophora meticulosa
Hadena adusta
,, dentina
,, oleracea
,, thalassina
,, genistæ
Xylocampa lithorhiza
Habrostola tripartita
,, triplasia
Plusia chrysitis
,, gamma
,, moneta
Catocala nupta

GEOMETRÆ

Uropteryx sambucaria
Epione apiciaria
Rumia cratægata
Pericallia syringaria
Selenia illunaria
,, var. juliaria
Selenia lunaria
Odontopera bidentata
Crocallis elinguaria
Ennomos tiliaria
,, erosaria
Himera pennaria
Amphidasys betularia
Hemerophila abruptaria
Boarmia repandata
,, rhomboidaria
Geometra papilionaria
Phorodesma bajularia
Iodis lactearia
Hemithea thymiaria
Acidalia dimidiata
,, bisetata
,, virgularia
,, imitaria
,, aversata
Timandra amataria
Cabera pusaria
Bapta taminata
Halia wavaria
Panagra petraria
Abraxas grossulariata
,, ulmata
Lomaspilis marginata
Hibernia rupicapraria
,, marginaria
,, defoliaria
Cheimatobia brumata
Oporabia dilutata
Larentia didymata
Eupithecia pulchellata
,, centaureata
,, subfulvata
,, nanata
,, subnotata
,, vulgata
,, minutata
,, assimilata
,, exiguata
,, sobrinata
,, rectangulata
Thera variata
Hypsipetes elutata
Melanthia ocellata
Melanippe subtristata
,, montanata
,, fluctuata
Anticlea badiata
,, nigrofasciaria
Coremia designata
,, ferrugata
Cidaria truncata
,, testata
,, fulvata
,, pyraliata
,, associata
Peturga comitata
Eubolia cervinata
,, plumbaria
Chesias spartiata

DELTOIDES

Hypena proboscidalis
Herminia tarsipennalis
,, grisealis

PYRALIDES

Pyralis costalis
,, farinalis
,, glaucinalis
Pyrausta purpuralis
Endotricha flammealis
Hydrocampa nymphæata
Botys hyalinalis

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Botys ruralis
,, urticata
Ebulea sambucalis
Pionea forficalis
Spilodes palealis
Scopula olivalis
,, prunalis
Stenopteryx hybridalis
Scoparia cembræ, var. Zelleri
,, mercurella

CRAMBI

Crambus pratellus
,, pascuellus
,, perlellus
,, tristellus
,, hortuellus

PHYCITIDÆ

Hypochalcia ahenella
Galleria mellonella
Aphomia sociella
Aciptilia pentadactyla
Alucita hexadactyla

TORTRICES

Tortrix podana
,, heparana
,, ribeana
,, forsterana
Peronea variegana
Teras contaminata
Penthina betulætana
,, ochroleucana
Pardia tripunctana
Aspis udmanniana
Sciaphila subjectana
Xanthosetia zoegana
,, hamana
Spilonota roborana

TINEÆ

Depressaria costosa
,, flavella

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OF THE

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EDITED BY JOHN HOPKINSON, F.L.S., F.G.S.,
Assoc. Inst. C. E.

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CONTENTS :

PAGES

Hertfordshire Maps : a Descriptive Catalogue of the Maps of the County, 1579 to 1900. By Herbert George Fordham. Part II, 1673–1794 (*to be continued*). With one Plate 173–212

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HERTFORDSHIRE NATURAL HISTORY SOCIETY AND FIELD CLUB.

THE objects of the Society are:—1. The investigation of the Meteorology, Geology, Botany, Zoology, Ethnology, Pre-Norman Archæology, and Topography of the County of Hertford. 2. The publication of the results of such investigation made by its Members. 3. The dissemination amongst its Members of information on Physics and Biology. 4. The formation of a Library of works on Natural History, and of a Museum illustrative of the Geology, Botany, and Zoology of the County. 5. The discouragement of the practice of removing rare plants from the localities of which they are characteristic, and of exterminating rare birds, fish, and other animals.

Evening meetings of the Society are held in the rooms of the Watford Urban District Council (Upton House) once a month during the Winter and Spring. Evening meetings are also held occasionally at St. Albans, Hertford, and other places. Field meetings are held during the Spring and Summer in various parts of the County.

Members pay an Entrance Fee of 10*s*., and an Annual Subscription of 10*s*., for which they may, if preferred, compound by a payment of £5. Ladies are eligible for election.

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HERTFO

From 'The New Description and State of

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)SHIRE.

gland,' by Robert Morden, 2nd ed., 1704.

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XX.

HERTFORDSHIRE MAPS: A DESCRIPTIVE CATALOGUE OF THE MAPS OF THE COUNTY, 1579 TO 1900.

By HERBERT GEORGE FORDHAM.

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PART II: 1673–1794.

Read at St. Albans, 2nd December, 1902.

1676 (c). Seller, John. 20 × 16¾. Scale, about 2 miles = 1 inch.

The boundaries on this map are extremely vague. It gives the hundreds, roads, and rivers, with the towns, villages, parks, hills, and many trees, and also a great many hamlets, houses and small places, windmills, churches, and beacons. The principal roads are shown by double lines (dotted in the open country), with indications of the junctions of the cross-ways with these roads. The map is divided into rectangular spaces, lettered on the left-hand side downwards, A to L, and numbered on the top from left to right, 1 to 14. In the bottom margin "Longitude west . . . ," and "Longitude east . . . . from y^e^ meridian of London." In the left-hand top corner is a large scrolled panel, with title, "Hertford Shire Actually Surveyed and Delineated by John Seller Hydrographer to y^e^ King, *Cum Privilegio Regis*." In the bottom corner, on the same side, is an escutcheon with drapery, and a sheaf of corn, sickles, and two cherubs at the top, containing "The Explanation of the Map," followed by a list of the hundreds and other particulars. In the right-hand top corner is a large indicator of the points of the compass, and in the right-hand bottom corner is an eight-sided, plain panel, which in some impressions of the map is blank, and in others contains: "Sold by Geo. Wildey at the Great Toy Spectacle China Ware and Print Shop the Corner of Ludgate Street near St. Pauls London." This map is, apparently, from an earlier plate than that of the similar map of Herts next noted. It is the first map of the county drawn on the meridian of London.

In the Preface to 'Camden's *Britannia* Abridg'd,' 2 vols., London, 1701, 8vo, is the following reference to Seller:—"What his Skill and Abilities were in these Matters, is very well known to the present Age: King Charles and King James II. chose him to Survey the several Counties, being perfectly assured of his Fitness for such a Province, and his Integrity to perform it; . . ."

1676. Seller, John. 20½ × 16¼. Scale, about 2 miles = 1 inch.

A re-engraved copy of the map last catalogued, giving the same details, and being nearly of the same dimensions and generally similar. It is, however, better drawn, the hills and trees are more artistic, and the writing throughout is more upright and clearer. There are both differences and additions in the marginal

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notes, title, and ornamentation. The panel in the left-hand top corner gives the title as follows:—"Hertford Shire Actually Survey'd and Delineated By John Seller Hydrographer to the King. *Cum Privilegio Regis.*" Against the left-hand margin of the map, in the squares 1—E and 1—F respectively, are added shields with coats of arms under coronets inscribed below: "Roger Earle of Clare and Hertford" and "Ed: Semour Ea of Hertford." In the left-hand bottom corner "The Explanation of the Mapp" contains the following, amongst other particulars:—"The Squares on the Mapp serve for a Universall Scale, the side of each Square Containing three statute or common miles, whereof 5280 feet make one mile," and:—"On the east side of the Mapp is placed y^e^ Meridian line, each Degree of Latitude Containing 69½ of common or Statute Miles and 14 Pole and is Devided [*sic*] into Minutes and each Minute in 15 seconds." In the right-hand bottom corner, in place of the panel in the map last noted, is a large coat of arms, with scrolls, supporters, and motto, "*Fide et Fortitudine*," and below, on a pendant cloth, "To His Excellency Arthur Earle of Essex Vicount Maldon Baron Capel of Hadham L^d^ Leiutenant of the County of Hertford one of His Ma^tys^ most Hon^ble^ privy Councill L^d^ Leiutenant Generall and Generall Governor to his most Excellent Ma^tie^ King Charles y^e^ 2^d^ of his Kingdom of Ireland in y^e^ eight and twentieth Year of his Ma^ties^ Reigne Anno . . Dom. 1676. This Mapp is humbly Dedicated by John Seller, Hydrographer to the King."

It gives the meridian of longitude E. and W. from London.

This map is found in an atlas of county maps, mostly reprints from Saxton's plates, but some by Speed, and containing Surrey by Seller, Oliver, and Palmer, and Middlesex and Oxfordshire by Seller. It was issued by Lea. A copy exists in the Pepysian Library. (See also under Saxton, 1689, *post.*)

A fine (and, apparently, later) impression of the map, with some trifling alterations, especially the addition in the title of the names of John Oliver and Richard Palmer, and the omission of the words "Hydrographer to the King," and of the coats of arms on the left-hand side of the map, is found in the British Museum in a large folio volume of maps, containing county maps mostly reprints of Speed, with some of Saxton, without date, the title being: 'A Collection of the County Mapp's of the Kingdome of England and Principality of Wales By John Seller.' The first map in this collection is a large one of London, Westminster, and Southwark, as rebuilt after the Great Fire, "Published by John Seller and are to be sold by him at the Hermitage in Wapping and by John Hill in Exchange Alley London. John Oliver *fecit.*"

*** 1676. Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

Another unaltered, but rather fainter, impression of the map of 1611 and 1666, except that the imprint is that first found in the plates of 1662, viz.: "Performed by John Speede and are to be sold

* prefixed to a date indicates a reprint.

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by Thomas Basset in Fleet street, and Richard Chiswell in S^t^ Pauls Church yard." This edition of the map can be identified by the text on the back, which is headed in plain capitals "Hertfordshire. Chap. XX," with the D larger than the rest of the type and set too low. The initial letter of the commencement of the description of the county is a plain capital $\frac{7}{8}$ inch high, with a background of coarsely-shaded scrolls. The text of the description is that of the other editions of the 'Theatre,' in (9) paragraphs, but the list of hundreds and places is set in four columns instead of five.

Occurs in an edition (which is probably the sixth and last in English) of Speed's 'Theatre,' published with the 'Prospect,' in one volume, by Edward Phillips, the elder of Milton's two nephews, London, 1676, folio. The dedication to the Lord Mayor, Aldermen, and Sheriffs of London, in which he addresses them as "The Props and Pillars of this Renowned City," is signed by Phillips. In the title it is stated that "In this New Edition are added; In the Theatre of Great-Britain, The Principal Roads, and their Branches leading to the Cities and chief Towns in England and Wales; with their computed distances. In a new and accurate method. The Market Towns wanting in the former Impressions. A Continuation of all the Battels fought in England, Scotland, Wales, and Ireland; with all the Sea-Fights to this present time. The Arms of all the Dukes and Earls, whose Titles of Honour were wanting in each particular County, to the last Creation." But, although some of the maps have additional coats of arms and perhaps some other additions (e.g. Cambridgeshire), no roads are inserted, and the additions of the "Battels" and Roads are found at the end of the 'Theatre' in a number of sheets of letterpress description. The map of Herts, as noted above, is without alteration of any kind from the earlier impressions. This work is "Printed for Thomas Basset at the George in Fleet-street, and Richard Chiswel at the Rose and Crown in St. Paul's Church-yard, MDCLXXVI." It is licensed by Roger L'Estrange,* under date Aug. 2, 1675.

*** 1676. Speed, John.** $4\frac{1}{16} \times 3\frac{15}{16}$. Scale, 8 miles = 1 inch. Engraved by Peter Keer [1599].

A further reprint of the small map ascribed to 1620.

From 'England . . . . Described and Abridged . . . . .' by John Speed, London, 1676, obl. 12mo.

The engraved title-page is as that in the edition of 1666, but re-dated. A sub-title runs as follows:—'An Epitome of Mr. John Speed's Theatre of the Empire of Great Britain. And of His Prospect Of the Most Famous Parts of the World.' It bears the imprint: "London, Printed for Tho. Basset at the George in Fleet Street, and Ric. Chiswel at the Rose and Crown in S^t^ Paul's Church-yard. 1676." The title of a second part, bound up in the same volume, is: 'A Prospect of the Most Famous Parts of the World.' It is dated "London, Printed by W. G. 1675."

* L'Estrange was Licenser of the Press to Charles II and his successor, was M.P. for Winchester in James II's Parliament, and died in 1704 at the age of 88.

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*** 1677. Garret, John.** Map filling triangular space about 3 × 3. Scale, about 20 miles = 1 inch.

A further impression of the map printed in the 'Book of the Names' of 1657. This map is paged (improperly) 70, with 72 on the back.

From a reprint of the 'Book of the Names,' London, 1677, 4to. The title of this volume is identical with that of the previous issues, but it is "Printed by S. S. for John Garret, at his Shop as you go up the Stairs of the Royal Exchange in Cornhil: Where is also sold all sorts of large and small Maps of the World, or any particular part thereof, with variety of Prospect Cities, 1677."

*** 1681. Speed, John (Blome, Richard).** 8½ × 5¾. Scale, 6 miles = 1 inch. Engraved by Wenceslaus Hollar [1670 or 1671].

A reprint of the map of Herts described under date 1671 (?), *ante* p. 31, but without the number 17, and with the addition, in the panel in the left-hand bottom corner, below the list of the hundreds, of a coat of arms and the dedication "To the Worshipfull G°orge [*sic*] Hadley of East Barnet Esq: This Mapp is D.D. by R. B." The map has no roads. It occurs in a small octavo set of Blome's county maps indexed under Speed in the British Museum Library, but without text, and dedicated to Sir Thomas Fitch by Richard Blome. The volume contains also a folding map of England, the Netherlands, and the adjoining parts of Europe, "W. Hollar *fecit* A° 1667," and the county maps, where dated, bear the original dates (1671, etc.). The title is in coarse type—'Speed's Maps Epitomiz'd: or the Maps of the Counties of England, Alphabetically placed. London Printed Ann. Dom. 1681.' It is referred to in Gough's 'Anecdotes,' at p. 43. It would appear from this reference, which is repeated in Gough's 'British Topography,' 2 vols., London, 1780, 4to, that the work was reprinted in 1685, but the matter is not clear, and I have not seen any other copy than that noted above.

This is the original series of small county maps by Hollar issued by Blome about 1670–71. It seems probable that the re-issue by Thomas Taylor of this collection, under the title 'England Exactly Described,' did not take place until early in the eighteenth century, and the statements under the head of "1671 (?). *Taylor, Thomas*" (p. 31 *ante*) must be read with this qualification. Gough, in his 'British Topography,' vol. i, at pp. 103, 104, gives the title of this work of Taylor in full, but does not indicate any date of publication, only saying that the maps are dated 1715, 1716, 1718. The earlier issues, up to one in which occurs a map of Scotland dated 1715, do not show the roads, but a copy containing this map, as well as one of Ireland dated 1716, has the roads inserted (q.v. *post*, p. 184).

*** 1683. Valk, Gerard, and Peter Schenk.** 22 × 17. Scale, about 2 miles = 1 inch.

Jansson's map of Middlesex and Herts of 1646, reprinted

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without text, with the addition of meridian lines (longitude reckoned from the Azores), and with the imprint "*Amstelodami. Apud G. Valk, et P. Schenk*" in lieu of that of Jansson.

The only copy of this map known to me is that in the collection of Mr. Lewis Evans (Herts County Museum), and I have not been able to find in any library the volume or atlas from which it is taken; but, in Strutt's 'Biographical Dictionary of Engravers,' 2 vols., London, 1785, 4to, in vol. ii, at p. 373, under the heading "Gerard Valck," it is stated that he "assisted Peter Schenck in publishing the large Dutch Atlas, in two volumes, folio, 1683." It seems probable, therefore, that Mr. Evans' map belongs to this Atlas. (Reprinted in 1724, in the '*Atlas Anglois.*')

*** 1689 (c). Saxton, Christopher [Lea, Philip].** 20 × 15¾. Scale, about 2 miles = 1 inch. The original plate engraved by Nicholas Reynolds, of London [1577].

An impression from Saxton's plate, with the whole of the design in the left-hand top corner cut out, except the words "Parte . . . . of Bedforde." In the bottom right-hand corner the word "Essex" and Seckford's arms are erased, and a new title, "Hartford Shire by C: S: Corrected and Amended with many Additions by P. Lea," is inserted. The map itself appears to have been unaltered from the plate as engraved by Reynolds. This would appear to be the first or an early print of Saxton's maps as issued by Lea. It is found in an Atlas of County Maps in the Douce Collection in the Bodleian Library, which has for title: "All the Shires of England and Wales Described by Christopher Saxton Being the best and original Mapps. With many additions and Corrections by Philip Lea." It has no date, but the map of England bears the initials "W. R.," and as the reign of William III commenced in 1688, the Atlas must be ascribed to not earlier than that date. A few maps are re-dated, e.g., Hereford, 1665, Somerset, 1685, and the latest, Wiltshire, 1689, which brings the collection up to the last-mentioned date.

A later copy of Saxton's map as amended by Lea, and in which the amendments have been carried much further than in the above impression, exists in the collections of Mr. Greg and Mr. Evans (Herts County Museum). I am unable to give it any definite date. Almost all the marginal matter and ornamentation has been cut out and replaced as follows:—In the left-hand top corner is a plan of the town of Hertford, in a rectangular panel 5⅝ × 3⅝, with a border of three plain ruled lines. At the top of the plan, rather to the left, "Hartforde" on scroll. Towards its left-hand top corner is a shield with a hart lying down to left, and in the left-hand bottom corner a panel with a list of buildings and streets in the town distinguished by letters A to P. At the bottom, towards the right-hand side, a circular indicator of the north resting on an ornamental panel with scale of (100) "Pases."

Below this plan of Hertford are three shields with crowns, suspended, with a scroll under each. The first and second from

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the left are inscribed "Roger Erle of Clare and Hartford" and "Edward Seimour Erle of Hartford" respectively. The third shield and scroll are blank. The title of the map, in the right-hand bottom corner, is as above set out, in a scrolled and ornamented oval panel.

A good many places and names are inserted in the map itself, amongst others the New River, a road, indicated by a single line, from Dunstable to Royston through Hitchin and Baldock, with a branch from Hitchin to Norton, and one drawn with a double line from Watford to St. Albans, etc. The rivers are altered from the original in some cases, and their names are inserted. The new names are in rather larger lettering than the old ones.

In the Pepysian Library, in Magdalene College, Cambridge, is another of Lea's Atlases of Saxton's Maps, in which Herts is Seller's map with the date 1676, and Bucks, Middlesex, and Surrey are also by Seller; a map of Essex, in Seller's style, is signed by William Morgan, and there is a map of the county 20 miles round London, which is in Seller's style. There are a few other maps by other engravers, but the collection is in the main that of Saxton, the maps showing the roads, and being re-dated as above noted. The marginal ornamentation does not appear to have been altered, but the maps have been "Corrected and Amended with many Additions by P. Lea." The title-page of this Atlas runs: "The Shires of England and Wales Described by Christopher Saxton. Being the Best and Original Mapps. With many Additions and Corrections, viz. y^e^ Hund^ds^, Roads, Etc., by Philip Lea. Also the New Surveis of Ogilby, Seller, etc."

As Pepys died in 1703, and the atlas is in his original binding, it must have been issued between 1689 and the latter date.

Other copies of Lea's Atlas are in the Douce Collection and the Gough Library in the Bodleian Library.

There seems to have been a reprint of this series of maps by Thomas Bowles in 1733 (see under that date *post*, p. 188).

1695. Oliver, John. 31 × 23¼. Scale, 1 mile = ¼ inch.

A well-filled map, similar in style to John Seller's map of Herts of 1676. It shows the boundaries of the hundreds, and the roads, rivers, towns, villages, parks and beacons, with trees and hills, and is divided into squares lettered A to K on the left-hand side of the map, and numbered 1 to 13 along the top. In the left-hand top corner, in a large panel ornamented with scrolls, sheaves of corn, fruit, etc., "The Actual Survey of the County of Hertford; Containing the Miles, Furlongs, and Poles, between Place and Place on all the Roads in the Survey exactly Measured and set forth in a Printed account, hereunto annexed, A work never done to any County before. Also an Alphabetical Table of the Nobility and Gentry, with a ready method for the finding their Particular Seats, or Places of Residence in the said County. By John Oliver. *Cum* . . . . *Privilegio* 16 . . . . 95." In the bottom corner on the left of the map is a scrolled panel of "Explanations"

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very like that on Seller's map, in which, amongst other things, it is stated that "On the East Side of the Map is placed the Meridian Line and is divided into Minutes, and each Minute into 15^{ths} of Seconds, Commencing from the Latitude of London 51^{s} 32^{m}, y^{e} scale of Miles goes round y^{e} Map." A large ornamental star with 32 points of the compass is engraved in the right-hand top corner of the map, and in the right-hand bottom corner is a large panel surrounded by heavy scrolls, which, in the copies of the map I have seen, is blank, and has below it "This Map is humbly Dedicated and Presented By John Oliver." No doubt there are impressions of the map in which the coat of arms of a patron is inserted, but I have not seen any.

This map does not, so far as I am aware, appear in any collection or atlas, and I do not know that Oliver engraved maps of any other counties than Herts.

1695. Camden, William. 17¾ × 14¼. Scale, about 2 miles = 1 inch. Drawn by Robert Morden.

A rather delicately engraved and thinly covered map, showing the hundreds, roads, rivers (with bridges), towns, villages, hamlets, houses, parks, woods, hills, and beacons. The design runs into the margin in several places. The margin is of two plain lines, with degrees and minutes marked. In the top border of the map is "Minuit of Time," and "Longitude East from London in Minuits of Time," and at the bottom "Longitude West from London in Degrees and Minuits." In the left-hand top corner, in coarsely ornamented, scrolled panel, "Hertford Shire By Rob^{t}. Morden." In the right-hand bottom corner is, "Sold by Abel Swale Awnsham and John Churchil," and below, "A Scale of Miles," with, again below, three different scales of (5) miles. The map is on thin yellowish paper.

This map is from the first edition, in one volume, of Camden's '*Britannia*,' by Edmund Gibson, of Queen's College, Oxford, afterwards, successively, Bishop of Lincoln and London. London, 1695, folio. The subsequent editions of this work are in two volumes folio, 2nd ed. 1722, 3rd ed. 1753, 4th ed. 1772, and contain impressions of the same map of Herts. It is probable that the set of county maps by Morden which illustrates Gibson's Camden, and in which the above-mentioned map of Herts occurs, was first printed in Gibson's work, although it is possible that it may have appeared earlier in atlas form. An atlas of these maps in the British Museum, without title or date, is ascribed to 1680 (?), but it seems more probable that it was issued *after* the first edition of Gibson, and I have catalogued it under date 1700 c. (q.v. *post*), though it may very well have been later still. In the printed 'Catalogue of the Books, relating to British Topography, ... bequeathed to the Bodleian Library, in the year MDCCXCIX, by Richard Gough,' Oxford, 1814, 4to, there is a note on p. 1 referring to this atlas, and stating that the maps were "drawn originally for the English 'Britannia'"; and Gibson himself, in his

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Preface, says: "The Maps are all new engrav'd, either according to Surveys never before publish'd, or according to such as have been made and printed since Saxton and Speed. Where actual Surveys could be had, they were purchas'd at any rate; and for the rest, one of the best Copies extant was sent to some of the most knowing Gentlemen in each County, with a request to supply the defects, rectifie the positions, and correct the false spellings. And that nothing might be wanting to render them as complete and accurate as might be, this whole business was committed to Mr. Robert Morden, a person of known abilitie in these matters, who took care to revise them, to see the slips of the Engraver mended, the corrections, return'd out of the several Counties, duly inserted. Upon the whole, we need not scruple to affirm, that they are by much the fairest and most correct of any that have yet appear'd."

1695 (?). Seller, John. 5⅛ × 4⅛. Scale, 8 miles = 1 inch.

This little map gives the hundreds (distinguished by letters referring to a marginal list), roads, rivers (including the New River), towns, and villages, with trees and hills. It is divided by vertical and horizontal lines three miles apart, into squares which mark the distances east and west, and north, respectively, from London. In the right-hand bottom corner along the lower margin of the map, "M: East from London," and on the right-hand side, "Miles North from London." In the left-hand top corner, in a clumsily-drawn, oval, shaded scroll, "Hartford Shire By John Seller," and in the bottom corner on the same side a list of the Hundreds, lettered A to H.

From '*Anglia Contracta*, or A Description of the Kingdom of England and Principality of Wales, in Several new Mapps of all the Countyes therein Contained By John Seller Hydrographer to The King,' a small thick volume in 12mo. A copy in the British Museum has no date, but it is ascribed to 1695 in the Library Catalogue. In Gough's Catalogue this work is, however, referred to as "*circ.* 1690."

The book has an ornamental title with portraits of King William and Queen Mary, a second engraved title-page with figures of "A Britain" and "A Saxon" on the left and right, with the above title in a panel between them. These are followed by various maps of England and Wales, sheets of the arms and seals of the Bishops, etc.; then a series of county maps arranged in alphabetical order, folding in the middle, with a single-page list of the hundreds preceding each.

(Reprinted in an epitome of Camden's '*Britannia*' in 1701, in Seller's History of England [3rd ed.], 1703, and with title altered, in 1787, in Grose's 'Antiquities of England and Wales.')

*** 1700 (c). Morden, Robert.** 17¾ × 14½. Scale, about 2 miles = 1 inch.

An unaltered reprint of the map of Herts which first occurs in

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the set of county maps by Morden in Gibson's edition of Camden's '*Britannia*' of 1795.

From an Atlas of County Maps without date or title, folio, dated 1680 (?) in the British Museum Catalogue, but, for reasons stated at p. 179 *ante*, more probably not earlier than 1695. I have also a copy of this collection of Morden's maps separately bound, without title. The impressions of the plates are fainter than those in the 3rd edition (1753) of the '*Britannia*,' so that this separate issue may be later than 1753. My copy contains the whole of the 61 plates found in the '*Britannia*,' including the series of maps of the English Counties.

1700 (c). Morden, Robert. 8¼ × 6⅝. Scale, about 5 miles = 1 inch.

Map of Herts from Morden's small Atlas, the first edition, of which, however, I have not seen a copy. It is much like Morden's large map, drawn on the same plan, and with much the same detail; but the names of places and the spellings differ, and the meridians both of latitude and longitude are slightly different from those laid down on the larger map. Gives the hundreds (indicated by capital letters), roads, rivers (with a few bridges), towns, villages, hamlets, houses, parks, woods, and beacons. Some of the principal houses, and a few of the hamlets and detached parts of hundreds, are also indicated by small letters, referring to a list in the margin. The border of the map is of double lines, with degrees in minutes of latitude and longitude marked. In the top border, "Hours from . . . . London" and "Nor-th." In the bottom border, "West from . . . . London" and "East . . . from London . . . Degrees." In the left-hand top corner, in a column against the left-hand side of the map, is a list of houses, etc., lettered *a* to *w*, and to its right, within a wreath incomplete at the top, "Hartford shire. By R^t^. Morden at the Atlas in Corn-hill. London." In the left-hand bottom corner, in another column, a list of "The Hundreds," lettered A to H. Towards the right-hand bottom corner "A scale of Miles," with three scales below it.

(Reprinted in the second edition of the Atlas, 1704, and, slightly altered, in another edition of the county maps, with three maps (of England, etc.) added, by Moll, in 1708, and again in the '*Magna Britannia et Hibernia*' of 1720.)

1700. Chauncy, Sir Henry. 18¾ × 14¼. Scale, about 2 miles = 1 inch. Engraved by Herman Moll.

A plain map, on thin paper, very like Seller's map of 1676, showing the hundreds, rivers, roads, towns and villages, gentlemen's houses and parks, water and windmills, and other details. The meridians are marked in the margin. In top border: "Longitude East from London in Minutes of Time." In scrolled panel in left-hand top corner: "The County of Hertford. With Additions and Corrected and Amended in many places. H. Moll *Fecit A°* 1700." To the right of the map against top border, scale of miles,

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and "English Miles 60 in One Degree." In the right-hand bottom corner: "The Explanation of this Mapp," with particulars of the various signs employed. From 'The Historical Antiquities of Hertfordshire,' by Sir Henry Chauncy, Kt., Sergeant-at-Law, 1 vol., London, 1700, folio.

This work was reprinted at Bishop's Stortford in 2 vols., 1826, 8vo; the map of Herts being redrawn, on stone, by C. S. Tyler.

*** 1701. Camden, William.** $5\frac{11}{16} \times 4\frac{3}{4}$. Scale, 8 miles = 1 inch. Engraved by John Seller [1695 ?].

A reprint of Seller's map of Herts in his '*Anglia Contracta*' ascribed to 1695.

This map is one of the series of county maps in 'Camden's *Britannia* Abridg'd; with Improvements, and Continuations to this present time . . . . The whole Carefully Perform'd, and Illustrated with above sixty Maps Exactly Engraven. London, Printed by J. B.* for Joseph Wild, at the Elephant at Charing Cross. 1701.' 2 vols., London, 1701, sm. 8vo. It is a translation of Regnerus Vitellius' Latin epitome of the '*Britannia*' published in 1617 (q.v. *ante*, p. 17), as appears from the Preface, in which also it is stated that "the maps are taken from the Plates of the late Ingenious Mr. Seller, Hydrographer to King Charles II, King James II, and His present Majesty."

*** 1703. Seller, John.** $5\frac{11}{16} \times 4\frac{3}{4}$. Scale, 8 miles = 1 inch.

An unaltered reprint of the map by Seller in the '*Anglia Contracta*' of 1695 (?).

From 'The History of England: . . . . . with the Maps of all the Counties and Islands belonging to England, being in all Seventy Copper Cutts,' 3rd. edition, London, 1703, 8vo. The map of Herts accompanies the 'Remarks on Hartfordshire' at the end of Chapter x of this work. I have not been able to find the earlier editions.

*** 1704. Morden, Robert.** $8\frac{1}{4} \times 6\frac{5}{8}$. Scale, about 5 miles = 1 inch.

An unaltered reprint of the map of Herts in the first edition of Morden's small Atlas, assumed to have been issued about 1700.

From the second edition, of which the title is 'The New Description and State of England, containing the Maps of the Counties of England and Wales, In Fifty-Three Copper Plates, Newly design'd by Mr. Robert Morden, Exactly Drawn and Engraven by the best Artists . . . . . The Second Edition.' London, 1704, obl. 4to. This Atlas is also found of the same title and date in octavo, the maps folding in the middle.

*** 1708. Morden, Robert.** $8\frac{1}{4} \times 6\frac{5}{8}$. Scale, about 5 miles = 1 inch.

A reprint of the map of Herts in Morden's small county Atlas, 1700 (c) and 1704. It differs from the original plate by the thickening of the lines indicating the Watling and Ermin Streets,

* B. = Brockwell (see Nichols' Catalogue of the Hoare Library, 1840).

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and their extension, as well as that of the other principal roads, beyond the borders of the county, and the writing-in of directions where the roads quit the county, e.g., "to Barwick," "to King's Lyn," "to Okeham," "to London." A star is also added above both Hertford and St. Albans, showing that they returned members to Parliament, and, in the right-hand bottom corner, is inserted a circular indicator of the points of the compass.

From an Atlas of 56 maps by Moll and Morden, London, 1708, obl. 4to. The general maps (England, etc.) are by Moll, and they are followed by the series of county maps by Morden.

1713 (c). Speed, John. 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

A print of the plate of 1611, following that in the 'Theatre' of 1676, with Bassett & Chiswell's imprint, but with the addition of two roads indicated by double lines roughly drawn (one being through "High Bernet," St. Albans, and Luton, with a branch from St. Albans through Kensworth, and the other through Enfield Chase to Hoddesdon and Ware), and, in the space under the original text in the bottom of the panel in the right-hand bottom corner of the map, "Sold by Henry Overton at the White Horse without Newgate, London."

Speed's maps were re-issued in the form of an atlas without letterpress, which must have appeared at the above date or soon afterwards, by Henry Overton. An atlas lent to me by Mr. Charles P. Ayres, of Watford, seems to be this issue in its original binding and state. This copy has pasted on the flyleaf opposite the title-page, "A Catalogue of a Set of Maps of the several Counties of England and Wales . . . . Printed and Sold by Henry Overton, at the White Horse without Newgate, London. Sold either in Compleat Sets, or singly." The title-page is the engraved title of the 'Theatre' of 1611, but the central panel contains: "England Fully Described in a Compleat Sett of Mapps of y^e^ County's of England and Wales, with their Islands, Containing in all 58 Mapps," and "Printed and Sold by Henry Overton at y^e^ White Horse without Newgate London." It is not dated. The first map in the series is one of England and Wales, showing the roads, and with views of the county towns, thirteen on either side, in the margin, and various other views, one being "London on Fire, Sep^br^ ii, 1666." There are, then, the 58 county maps, those which are dated having, with the few exceptions noted below, the original date of the map in Speed's collection of 1610. They are generally "sold by Henry Overton," but some have earlier names remaining. Herts has no date; Dorsetshire, Essex, Hunts, and Carmarthen are 1662; Sussex, Bucks, and Derbyshire, 1666; and Suffolk is 1713. The title of the last is: 'A New Mapp of the County of Suffolk; with the Post and Cross Roads, and other remarks, according to the latest and best observations. 1713.' In Mr. Greg's collection is a map of Essex with the same date and a similar title, also sold by Henry Overton.

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There appear to have been some subsequent issues of this Atlas. One of 1743 is referred to in 'British Topography' (1780), and I have seen an impression of a map of Herts of a still later date, apparently, as the imprint "sold by C. Dicey & C°. in Aldermary Church Yard, London," has a very modern aspect. I have no clue, however, to its date.

***1715 (c). Taylor, Thomas.** 8½ × 5¾. Scale, 6 miles = 1 inch. Engraved by Wenceslaus Hollar [1670 or 1671]. The map of Herts described under Taylor, 1671 (?), *ante*, p. 31, unaltered.

The atlas published by Taylor, without date, of which the full engraved title is (in the copy ascribed to 1716 and catalogued below): 'England Exactly Described Or a Guide to Travellers In a Compleat Sett of Maps of All the Counties of England; being a Map for each County, Wherein every Towne and Village is Particularly Express'd with the Names and Limits of every Hundred, and the Roads and Distances in Measured Miles according to Mr. Ogilby's Survey,' contains, in the two copies I have examined in the British Museum Library, in addition to the set of Blome's small county maps, a map of the "North Part of Great Britain called Scotland," dated 1715, and one of England, undated, both by Taylor. These two copies are both ascribed to 1715 in the British Museum Catalogue, and the maps do not contain the roads.

In a third copy in the Museum, indexed under Ogilby (see below, 1716 c.) is a "Mapp of Ireland" by Taylor, dated 1716, and roads are inserted in the maps.

***1716 (c). Taylor, Thomas.** 8½ × 5¾. Scale, 6 miles = 1 inch. Engraved by Wenceslaus Hollar [1670 or 1671].

Another impression of the map of Herts described at p. 31 *ante*, with the main roads shown by double lines, and with the distances inserted in figures in small circles on the line of road. In the copy in the British Museum the space under the title and the bottom panel in the left-hand bottom corner are blank.

From a copy of 'England Exactly Described,' containing a map of Ireland dated 1716, by Taylor, and ascribed to that date in the British Museum Catalogue, in which it is indexed under Ogilby.

1720. Cox, Thomas. 8¼ × 6¾. Scale, about 5 miles = 1 inch. Drawn by Robert Morden.

A reprint of the map in the small Atlas previously noted under the dates 1700 and 1704, in the amended form in which it appeared in 1708.

From the '*Magna Britannia et Hibernia, Antiqua et Nova*, or, A New Survey of Great Britain,' vol. ii, London, 1720, 4to. There is also a quarto atlas of these maps, of which a copy without title or

* Cox was vicar of Bromfield, Essex, 1685–1733. His '*Magna Britannia*' was first published in monthly numbers, as a supplement to Europe in the Atlas Geographus, and was afterwards collected into 6 vols., 4to; of which the 1st and 2nd came out in 1720; the 3rd in 1724; the 4th, 1727; the 5th, 1730; and the 6th, 1731. (Gough's 'Anecdotes,' p. 21.) This work also contains distance tables for each county, exactly copied from those published by Norden in 1625.

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date exists in the Gough Collection in the Bodleian Library, which may probably have been issued about the same time.

1720. Owen, John. 4⅛ × 4⅝. Scale, 10 miles = 1 inch. Engraved by Emanuel Bowen.

A small and rather confused map, showing the hundreds, roads, rivers, borough and market towns, villages, and a few hamlets, with here and there trees and hills. The details are not carried, in general, beyond the boundaries of the county.

The border is a narrow scrolled pattern between two ruled lines on each side. Against the top margin to the left of its centre, a plain panel with "Hertford Shire," and in the left-hand top corner a list of the hundreds, numbered 1 to 8. In the left-hand bottom corner a scale of (10) "English Miles." Below, within the border, and separated from the design of the map by a thin line, six lines of letterpress descriptive of the county. Above the map, within the same engraved plate, is an ornamental panel, with particulars of "the Road from London to Wells, etc." The plate is numbered 131. On the back are maps of the road in three strips, particulars of Newmarket, the arms of Brandon, and various marginal notes.

From '*Britannia Depicta*, or Ogilby Improv'd; Being a Correct Coppy of Mr. Ogilby's Actual Survey of all y^e^ Direct and Principal Cross Roads in England and Wales: . . . .' "By In^o^. Owen of the Midd: Temple Gent," and the maps "By Eman: Bowen Engraver." This is no doubt the first edition of this work. The title is set out in full in Rawlinson's 'English Topographer,' which is also of 1720, and the earliest copy in the British Museum is of this date. It is engraved throughout (except six pages of tables or indexes at the commencement) on both sides of the leaves, and is paged up to 273. The work is made up of reductions of Ogilby's copper sculps, or strips showing the roads, with their marginal notes (from his '*Britannia*,' London, 1675, folio), with the addition of a set of small county maps.

It was printed for and sold by Thomas Bowles and E. Bowen, London, 1720, 8vo.

(Reprinted in 1724, 1731, 1736, 1759, and 1764, and probably at some intermediate dates, which I have not been able to trace.)

*** 1722. Camden, William.** 17¾ × 14½. Scale, about 2 miles = 1 inch. Drawn by Robert Morden.

A reprint of the map of Herts in the first edition of Gibson's Camden (1695), with the one single alteration of the name "Furneux Pelham," the two words of which in the previous impression were written at some distance apart as if they were the names of two separate villages. In this and subsequent copies of the map "Pelham" is written-in close to "Furneux," and where it originally occurred it has been erased.

From the second edition of the '*Britannia*,' by Gibson, 2 vols., London, 1722, folio. In the Preface to this edition Gibson says of the maps that they "have been revised by knowing and skilful

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Persons in each County, and the Errors in the Spellings carefully amended in the Plates, according to the Corrections returned, so far as they appeared to be needful; that is, where the Name of the Place, as it stood in the former Edition of the Map, did not answer either the way of *writing* or the *common way* of *pronouncing* among the People. If it answered either of these, it was judged sufficient; if neither, it is corrected." And he adds: "But tho' the Maps thus amended, serve the purposes of the present Work, by carrying the eye of the Reader from place to place as he peruses the Descriptions, and do also, in the main, answer the other purposes of such Topographical Surveys; and tho', of late years, *particular Surveys* have been taken of some few Countries [*sic*], and Maps of them published with good degrees of Care and Accuracy: Yet it is much to be wished, for the honour of these Nations, that due Encouragement might be found for some skilful and diligent hands, to take *New Surveys* of the several Counties of *Great-Britain* and *Ireland*, in order to one uniform Body of Maps; so fair, with regard to the Letter, and so disentangled with regard to the Distances of the Names from each other, as to be not only useful, but easy and delightful to the Eye."

*** 1723. Norden, John.** 9⅜ × 7¾. Scale, about 4 miles = 1 inch. Engraved by John Senex, F.R.S.

A map of Herts engraved by John Senex, after the original map by Norden of 1598. This map, though closely copied, is distinguishable by a slight difference of dimensions, as well as by various particulars. In the scroll round the royal arms in the left-hand top corner "Penc" (*sic*) is substituted for "Pence" in the original, and there are other trifling variations. The original date and the words following, "*Wilhelmus kip Sculpsit*," are naturally omitted in the panel in the right-hand bottom corner.

From a reprint of the '*Speculum Britanniæ*,' which differs from the original work in some details of the type. The book is "Printed for Daniel Browne, Senior and Junior," London, 1723, 4to.

1724. Moll, Herman. 10$\frac{1}{16}$ × 7¾. Scale, about 3½ miles = 1 inch.

Gives hundreds, roads, rivers, towns and villages, with hamlets, houses, parks, hills, and woods. It has a double-ruled border, with the degrees and minutes of longitude and latitude marked, and the words "First meridian from London" in the margin. The hundreds are distinguished by capital letters A to H, and detached parts by small letters *i* to *l*, a detached part of the county being identified by the letter *m*. In the left-hand top corner, in rectangular panel, "Hertford Shire. By H. Moll Geographer," and below the panel a list of the hundreds. At the top of the map on the right-hand side, a list of the parts of the hundreds, etc., corresponding with the letters on the map. In the bottom right-hand corner a scale of (5) "English Miles," and a circular indicator showing the north and east. On either side of the map, within the engraved plate, are six coins, the plate, with the two columns of coins, being

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12½ inches wide. The left-hand column is headed "British Coins." In the left-hand top corner, in the margin of the map, is the number "(18)."

From 'A New Description of England and Wales, With the Adjacent Islands. Wherein are contained Diverse useful Observations and Discoveries In respect to Natural History, Antiquities, Customs, Honours, Privileges, Etc. . . . . To which is added, A new and correct Set of Maps of each County, their Roads and Distances; and, to render 'em the more acceptable to the Curious, their Margins are adorn'd with great Variety of very remarkable Antiquities, Etc. By Herman Moll, Geographer.' This work is printed for H. Moll, and sold by T. Bowles, C. Rivington, and J. Bowles. London, 1724, fol.

*** 1724. Moll, Herman.** 10$\frac{1}{16}$" × 7¾". Scale, about 3½ miles = 1 inch.

A reprint of the above map of Herts without alteration. From an atlas of the set of maps printed in the 'New Description,' with a new title-page, which runs as follows:—'A Set of Fifty New and Correct Maps of England and Wales . . . with the Great Roads and Principal Cross-Roads . . . Shewing the Computed Miles from Town to Town . . . All, except two, composed and done by Herman Moll, Geographer.' London, 1724, fol. It also occurs bound in 4to. It is sold by Moll, and Thomas and J. Bowles. (Reprinted in 1739, and again in 1753 without the coins in the margin, in Moll's 'British Atlas.')

*** 1724. Valk, Gerard, and Peter Schenk.** 22 × 17. Scale, about 2 miles = 1 inch.

A very fine impression of Jansson's map of Middlesex and Herts, first printed in 1646, with the addition of meridian lines and the imprint of Valk and Schenk, as in their Atlas of 1683.

From the '*Atlas Anglois, ou Description Générale de l'Angleterre, contenant Les Cartes Géographiques De chaque Province, ... A Londres, Chez Joseph Smith, Marchand Libraire à l'Enseigne d'Inigo Jones, proche Exeter-Exchange de le* [sic] *Strand.*' London, 1724, large folio. This Atlas contains a map of England, 35 county maps, and maps of North and South Wales, 38 in all, without text. There is a copy in the Grenville Library in the British Museum.

*** 1724. Owen, John.** 4$\frac{11}{16}$" × 4¾". Scale, 10 miles = 1 inch. Engraved by Emanuel Bowen.

A reprint of the map of 1720.

From an edition of the '*Britannia Depicta*, or Ogilby Improv'd,' of Owen and Bowen, published in the above year, and described on the title-page as "ye 4th Edition." It is sold by T. Bowles. It is to be presumed that, if the edition of 1720 was the first of this work, there were two intermediate editions in the four years 1720–24, but I have not come across either of them. London, 1724. 8vo.

1728. Salmon, Nathaniel. 17 × 15. Scale, about 2¼ miles = 1 inch. Engraved by J. Clark.

A map on yellowish, coarse paper, giving the hundreds, rivers,

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main roads, towns, villages, hamlets, parks, woods, houses, churches and chapels, wind- and water-mills, Roman stations, sites of battles, etc., many of the details being indicated by signs. It has a plain, double-line margin, but no title. In the left-hand top corner, in a rectangular panel, is an explanation of some of the signs used, and in the right-hand bottom corner, a "Scale of 5 Miles," and "J. Clark *sculp*" on the margin.

From 'The History of Hertfordshire; describing the County, and its Antient Monuments, particularly the Roman . . . .' London, 1728, folio. The Preface is dated at Bishop's Stortford, May 1, 1728.

*** 1731. Owen, John.** 4$\frac{1}{16}$ × 4$\frac{1}{8}$. Scale, 10 miles = 1 inch. Engraved by Emanuel Bowen.

Another reprint of the map of Herts of 1720.

From an edition of the '*Britannia Depicta*, or Ogilby Improv'd,' which was issued in the above year. I have not seen a copy of this edition. It is described as the fourth in 'British Topography,' vol. i, at p. 105, and a copy of this date is noted in the Catalogue of the Gough Library at p. 10.

*** 1733. Seller, John (?).**

There appears, probably, to have been a reprint of one of Seller's large maps of Herts of 1676, or, possibly, of Saxton's map as altered by Lea, but with Seller's name upon it, in an Atlas published by Thomas and John Bowles in 1733. I have not, however, seen either the map or the Atlas. In the British Museum Library are maps of Buckinghamshire, Kent, and Surrey, which all appear to have been printed from Saxton's plates, but altered to such an extent that the original design has almost disappeared. They all bear, "By John Seller," "Corrected and many additions by P. Lea," and "Printed and Sold by Thomas Bowles Print and Map Seller next the Chapter House in St. Paul's Church Yard, and John Bowles, Print and Map Seller at the Black Horse in Cornhill, London, 1733."

These three individual maps are not, of course, evidence of the publication of a complete Atlas, or of the Herts map in such an Atlas being that of Seller or Saxton, but the above date is noted as being that at which a large map of Herts was, in all probability, issued.

*** 1736. Owen, John.** 4$\frac{1}{16}$ × 4$\frac{1}{8}$. Scale, 10 miles = 1 inch. Engraved by Emanuel Bowen.

A further reprint of Bowen's map described under date 1720.

From another impression of the '*Britannia Depicta*,' also described as the fourth, and issued by Thomas Bowles, London, 1736, 8vo. I have a copy in my collection.

*** 1736 (?). Speed, John.** 20 × 15. Scale, 2$\frac{1}{2}$ miles = 1 inch. Engraved by Jodocus Hondius.

It is supposed that there was a reprint of Speed's maps of this date, but I can find no reliable evidence that it ever existed.

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*** 1739. Moll, Herman.** $10\frac{1}{16} \times 7\frac{3}{4}$. Scale, about $3\frac{1}{2}$ miles = 1 inch.

A reprint of the map of 1724 in the collection of Moll's county maps.

From 'A Set of Fifty New and Correct Maps of England and Wales,' apparently the 2nd edition. London, 1739, fol. I have not seen this re-issue.

1742. Badeslade, Thomas, and William Henry Toms. $5\frac{11}{16} \times 5\frac{3}{4}$. Scale, 7 miles = 1 inch. Drawn by Badeslade and engraved by Toms [29th Sept., 1741].

A map of the county with north to the right hand, and with wide shading outside boundary, so as to give it the appearance of an island. The rest of the space within the border slightly shaded. On the left-hand side, within the margin, a strip divided from the map itself by a single line, containing a list of the principal towns with dates of markets and fairs, the whole engraved within a plain double-lined border. At the top (west) of map, "A Map of Hertfordshire North from London," and, outside the margin at the right-hand top corner, the number 20. At foot below margin, "T. Badeslade *delin*," on left; in centre, "Publish'd by the Proprietors T. Badeslade and W. H. Toms Sept^{r} 29th, 1741"; and on right, "W. H. Toms *Sculpt.*"

The map itself shows the principal roads and rivers, a few hills and trees, the towns, and some villages and hamlets. In the right-hand top corner is a small star-indicator of the north (set to the right) in a circle, and with the letters W., S., and E. In the left-hand bottom corner a scale of (10) "English Miles." Where the roads leave the county the direction is given in some cases.

From the '*Chorographia Britanniæ*, or A Set of Maps of all the Counties in England and Wales.' At the foot of the title-page it is stated that "This Collection (conveying a more comprehensive Idea of South Britain than any thing hitherto publish'd) was first Drawn, and compiled into a Pocket Book, by Order and for the Use of his late Majesty King George I. By Thomas Badeslade Surveyor and Engineer, and now neatly Engrav'd by Will: Henry Toms." London, 1742, 12mo.

This work consists of 46 double pages of maps and 5 of letterpress (including tables of the roads and lists of towns), besides the title-page and dedication, which are also engraved.

All the maps and tables are dated in the same way at the foot, Sept. 29th, 1741.

I have a copy of this work in my collection. There are also two copies in the British Museum, both without date, but, apparently, published subsequently to the above edition, though probably in the same year. The maps in both are all "Publish'd by the Proprietor W. H. Toms Sept. 29, 1742," and there are added at the end of the volume in each case two plates of two pages each, No. 49, Rates for Hackney Coaches, and No. 50, Rates for Hackney Chairmen, making up 53 plates, besides the title-page and dedication.

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*** 1743 (?). Speed, John.** 20 × 15. Scale, 2½ miles = 1 inch. Engraved by Jodocus Hondius.

In Gough's 'British Topography,' vol. i, p. 91, it is stated that "Speed's Maps were reprinted 1743, fol.," but I have not been able to identify any atlas of Speed as having been published at that date.

1744. Dodsley, Robert. 7¼ × 5¼. Scale, about 6½ miles = 1 inch. Engraved by I. Cowley.

Shows the roads and rivers, and a few towns. The directions of four of the roads, where they leave the county, viz., to Potton, to Bedford, to Leighton, and to Uxbridge, are indicated by small figures of the human hand. The other roads have indications of direction, but the hands are absent. In the top border is: "Meridian of London" and "Min. E. Longit"; and at foot, on the left, outside the border: "Min. W. Longit from London." The title is in the top left-hand corner, in a nearly square, pendant cloth, as follows: "An Improved Map of Hertfordshire containing the Borough and Market Towns, with those Adjoyning; also its principal Roads and Rivers, by I. Cowley. Geographer to his Majesty." The left-hand bottom corner contains a scale of (10) "English Miles," and on the right-hand side of the map, opposite 52° of latitude, is a small circular indicator of the points of the compass with a cross on the east side. In the right-hand bottom corner is an "Explanation," with designs distinguishing the Borough and Market Towns on the map.

From the 'Geography and History of England, done in the manner of Gordon's and Salmon's geographical and historical grammars.' London, 1744, 8vo. (The book was reprinted in 1765, but the county maps were omitted from this edition.)

1745 (c). Warburton, John (Joseph Bland and Payler Smyth). 72½ × 42½. Scale, about 1 mile = ¾ inch. Engraved by S. Parker.

Map of Middlesex, Essex, and Herts, in one. A rather plainly engraved map in six sheets, showing hundreds, roads, and rivers, towns, villages, hamlets, parks, houses, windmills, turnpikes, woods, hills, and other details. The distances between towns are marked on the roads. The map is divided into squares, numbered along the top of the map 1 to 20, and lettered on the left-hand side *a* to *q*. In the top margin is: "Minutes of Time from London." On the right and left and along the bottom of the map are arranged in columns 729 coats of arms of the gentry of the three counties, distinguishing the seats in the possession of the various families, as marked on the map, by letters and figures, and with the name of the owner below each shield. Of these Middlesex has 212, Essex 332, and Herts 185, including some additional arms inserted in the right-hand bottom corner of the map itself. Along the bottom of the map, above the three rows of coats of arms: "The names of the Towns and Principal villages and Seats. In the County of Hertford. . . . In the County of Middlesex.

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. . . In the County of Essex." In the top left-hand corner of the map is the title, within a large scroll, with figures: "A New and Correct Map of Middlesex, Essex, and Hertford-Shire, With the Roads Rivers Sea-Coast Etc. Actually Surveyed.

By { John Warburton, Esq^r. Somerset Herald & F.R.S. / Joseph Bland and Payler Smyth, } Gent."

On the left-hand side of the map is an oval panel with the "Explanation of the Map," and at the foot, in the centre, are two rectangular panels having the form of the two pages of an open book, containing an "Explanation of the Arms," and to the right on the bottom margin "Engraved by S. Parker." In the left-hand bottom corner is an indicator of the cardinal points, with lines radiating from its centre, and in the right-hand bottom corner are additional arms for each county, and the arms of all the borough towns in the three counties.

This map, which I have examined in Mr. Greg's collection, has been enriched by the colouring and gilding, in the proper heraldic tints, of the coats of arms which form the most important feature of the work. Mr. Greg has examined the names of owners of the various Herts estates in order to establish the date of publication of the map. He notes that Warburton held the office of Somerset Herald from 1720 to the time of his death in 1759, and that "as a Chester is given in the map (No. 38, Herts) as owner of Newsells, near Barkway, and he only bought it (from a Jenyns) in 1743, the map must have been published between 1743 and 1759, when Warburton died, and before 1747, when Dr. Savage, Clothall Bury, died."

Warburton appears to have published a map of Northumberland as early as 1716.

In the Catalogue of the Gough Collection in the Bodleian Library, under the head of Middlesex, at p. 173, I find: "Proposals for publishing a new Map of Middlesex, Essex, and Hertfordshire, by John Warburton, Esq., 1720." In the same collection, at p. 180, is catalogued, "London and Middlesex illustrated, by John Warburton, Esq., Somerset Herald, 8vo, London, 1749." There is a copy of this work also in the British Museum. At this latter date Warburton published a map of Middlesex, on two sheets of imperial atlas, and a similar map of Essex was published, apparently about the same date, to which date it seems probable that the map of Herts described *post*, p. 194, may be attributed. There are some notes in the 'Literary Anecdotes of the 18th Century,' by John Nichols, London, 1812, 8vo, in vol. vi, pt. 1, at p. 141, etc., which throw some light, though not very much, on Warburton's work. It is there stated that he published in 1722–23 'A list of the Nobility and Gentry of the Counties of Middlesex, Essex, and Herts, who have subscribed, and ordered

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their Coats of Arms to be inscribed on a new map now making,' and that in 1728 this map is referred to in the 'Whitehall Evening Post,' Aug. 8th, as being to order. Then, in 1749, the map is referred to in Warburton's book on London and Middlesex.

It seems evident that the map was a very long time in preparation. Probably the inquiries and the collection of subscriptions were tedious. I have preferred to follow Mr. Greg's conjectures, and place the map late, rather than about or soon after 1728, as one might, were it not for his investigations based upon the ownership of the estates he refers to.

1746. Simpson, Samuel. $7\frac{3}{4} \times 6$. Scale, 4 miles = 1 inch.

A map with a single-line border, giving the hundreds, the roads and rivers, towns, villages, parks, hills, and trees. There is a band of shading round the county boundary, outside. At the top, outside the border, "Hertford Shire." In the left-hand top corner is a coat of arms with coronet and supporters, and the motto "*Sero sed serio*," and below "The Arms of the Right Honble. the Earl of Salisbury"; and, to the right of this coat of arms, an irregular-shaped, ornamental panel bearing three leopards, and the inscription below: "The Arms of Hertford." * In the right-hand bottom corner is a star-and-circle indicator of the north, with a scale of (5) English miles below it. The directions of the roads where they leave the county are indicated.

From 'The Agreeable Historian, Or the Compleat English Traveller: giving a Geographical Description of every County in that Part of Great Britain, call'd England . . . With a Map of every County prefix'd to each, from the best and latest Observations, after the Designs of Herman Moll, and others . . . Compiled from Camden, Leland, Dugdale, Ogilby, Morgan, and other Authors. By Samuel Simpson, Gent.' London, 1746, 3 vols., 8vo. The map of Herts is in vol. ii.

1746. The English Traveller. $7\frac{1}{8} \times 6\frac{1}{16}$. Scale, 4 miles = 1 inch. Engraved by John Rocque (?).

A map of Herts with a single-line border broken on the left side by the county boundary near Tring. Above the map is the title "Hertford Shire." It contains the same details, and is as nearly as may be of the same dimensions as the map in 'The Agreeable Historian' last mentioned, from which it appears to have been very exactly copied, even to the errors in spellings. The writing, however, differs slightly throughout, and in lieu of the coat of arms, etc., on the latter map, are, in the left-hand top corner, a circular indicator of the north and a scale of (5) miles only. There are no other ornamental additions to the map. An obvious difference exists also in the fact that in the earlier map the border is not broken on the left-hand side. This map shows the hundreds,

* This is a blunder; the Arms are those of the City of Hereford. The arms of the two counties have been transposed. Those of St. Albans are engraved on the map of Herefordshire.

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rivers, principal roads (continued a little beyond the county boundary, and with indications of their directions), towns, villages and hamlets, parks, churches, and many hills and trees rather coarsely engraved. It is shaded round the county boundary.

From 'The English Traveller: giving a Description Of those Parts of Great-Britain called England and Wales.' 3 vols., London, 1746, 8vo.

(This map is reprinted in Rocque's 'Small British Atlas,' 1753, 1762, and 1764(?), and also in 1769 in 'England Displayed' (see pp. 197, 200, 201, 202, and 206, *post*), but with a scale of 6 instead of 5 miles. The plate seems otherwise unaltered in these reprints.)

1748. London Magazine. 9 × 7. Scale, 5 miles = 1 inch. Engraved by Thomas Kitchin.

Shows the county, with its hundreds, roads (the "open" roads with dotted margins), rivers, borough and market towns, and villages, with the parks and hills. The map has a plain, ruled margin divided into degrees and minutes of latitude and longitude, the latter from London. In the right-hand top corner a very ornamental panel, with festoons of fruit and flowers, etc., and bearing: "Hertfordshire, Drawn from an Accurate Survey By T. Kitchin Geographer," and in the left-hand bottom corner a circular indicator of the N. and E. with star in centre. In the right hand bottom-corner, "Remarks," being a list of the indications on the map, and below, a scale of (8) "English Miles." On the left at bottom along margin "Longit: W. from London," and at foot "London Mag: for May, 1748."

From 'The London Magazine: or, Gentleman's Monthly Intelligencer,' London, 1732–1779, and continuation to 1785, 8vo. The map of Herts illustrates 'A Description of Hertfordshire' found in the May number of the 17th volume of this periodical. (The map is reprinted in 1786, in Boswell's 'Historical Descriptions,' q.v. *post*, p. 210.)

1748. Wale, S. 6⅛ × 5⅛. Scale, about 4 miles = 1 inch.

Copies of a map of Herts attributed to the publication mentioned below and the date 1748, are found in the collections of Mr. Greg and Mr. Evans, but I have not seen the book itself, which is not in any of the public libraries, so far as I know.

The map shows the roads and rivers, with towns, villages, hills, and trees. The degrees and minutes of latitude and longitude are marked in the margin. In the bottom border is: "Long. fro. London." Outside the map at the right-hand top corner is the number 17, and in the left-hand top corner, in a rectangular frame, ornamented like a picture-frame, is the title: "A Correct Map of Hertford Shire."

From the '*Geographia Britanniæ*, or correct maps of all the Counties in England, Scotland, and Wales, with general ones of both kingdoms, and of the several adjacent islands,' 1748, 2 vols., 12mo.

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This title is taken from Gough's 'Anecdotes.' It is mentioned there, and also in his 'British Topography,' in the chapter on Maps.

1749 (?). Warburton, John. 30½ × 24. Scale, about 1⅛ miles = 1 inch. Engraved by Nathaniel Hill.

Shows hundreds, rivers, main roads (with distances in miles between market towns, and junctions of cross roads), towns, villages, hamlets, parks and houses (with numbers relating to the shields of the owners, as shown on a separate sheet, corresponding to the shields on the margin of the larger map of Middlesex, Essex, and Herts, published about 1745, q.v. *ante*, p. 190), churches, wind- and water-mills, commons, woods, and hills, with sites of battles, Roman stations, religious houses, and springs of medicinal waters. It has a double-ruled, plain border, with degrees and minutes of longitude and latitude marked, and is ruled up into squares of three miles, numbered 1 to 15 along top margin, and lettered A to L on left. In the left-hand top corner is a large, scrolled, ornamental panel, containing: "To the Nobility and Gentry of Hertford Shire, Subscribers to the Work, This Map is most humbly Dedicated, by their Oblig'd Servant John Warburton, Somerset," with three surveying instruments, one on either side, and the third below the panel. In the bottom left-hand corner are two small coats of arms, inscribed, at the top, "Hertford," and "St. Albans," and "Nath[l]. Hill *Sculp.*" In the right-hand top corner a coarsely-drawn star-shaped indicator of the points of the compass, and, in the bottom corner on the same side, a very full "Explanation of the Map," in an ornamental, rectangular, upright panel. On the left of this panel, along the bottom border of the map, is a scale of miles, and a statement as to the squares on the map.

There is a copy of this map in Mr. Lewis Evans' collection (Herts County Museum), and one, much cut down, in the British Museum.

There is a good deal of doubt as to the dates of publication of Warburton's maps. The matter is discussed *ante*, pp. 191, 192. According to Gough ('Anecdotes,' p. 203, and 'British Topography,' vol. i, p. 433), this map was issued earlier than the large one of Middlesex, Essex, and Herts, but he does not give any reasons for thinking so, or a date for either map.

The year 1749 seems a probable approximate date for this map, because Warburton published in that year a work on the names and coat-armour of the nobility, etc., of London and Middlesex, and a map of Middlesex, and also about the same time (according to Gough) a map of Essex.

1749. Kitchin, Thomas, and Thomas Jefferys. 5¼ × 5⅛. Scale, 10 miles = ¼ inch.

Shows divisions of hundreds, rivers, principal roads (marked with distances in miles between towns), towns, a few villages, and parks. Shading round the boundary of the county, so as to give it the appearance of an island. Double-ruled border, with degrees

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and minutes of longitude and latitude, slightly broken by county boundary line at bottom (south of Rickmansworth). Above margin, at top: "A Map of Hertford Shire." In left-hand top corner a scale of (10) "English Miles," and below a circular indicator of the north, with a comparatively large cross on the right-hand side (east). Below the map, within the plate, are the names of the (2) borough and (18) market towns, with the days of markets and fairs.

From a small quarto volume, engraved throughout on one side of the paper only, containing an ornamental title-page, a preface, two whole-page maps of England, and 47 maps of the counties of England, etc.

The title, printed with an ornamental design, is: 'The Small English Atlas being A New and Accurate Sett of Maps of all the Counties in England and Wales.' There is an imprint below the design: "London, Publish'd according to Act of Parliam^{t} by Mess^{rs}. Kitchin and Jefferys 1749, and sold by M. Payne at the White Hart and M. Cooper at the Globe in Paternoster Row." London, 1749, 4to.

A copy is in the British Museum.

I have also a copy of this Atlas in my collection, without date, containing 52 plates in all, of which 50 are maps. In this copy the map of Herts is numbered "19" in the right-hand top corner. This atlas may have been issued prior to 1749. In the title is added "By T. . . . . Jefferys, Geo: to the King, and . . . . Tho^{s}. Kitchin, sen^{r}.," and it is sold by Robert Sayer and John Bennett, and John and Carrington Bowles. (Reprinted in 1751.)

*** 1751. Kitchin, Thomas, and Thomas Jefferys.** 5¼ × 5⅛. Scale, 10 miles = ¼ inch.

A reprint of the map of Herts in 'The Small English Atlas' of 1749, but with some trifling alterations in the spelling of the names (e.g. Hertford, instead of Hartford), and some places added. The printed matter at the foot of the map is differently arranged. The map is distinguishable from the earlier impression by these variations.

From an edition of 'The Small English Atlas,' London, 1751, 4to. There is a copy in the Library of the Royal Geographical Society, which bears at the foot of the title-page, after the date, "and sold by Tho^{s}. Jefferys Geographer to his Royal Highness the Prince of Wales at the corner of S^{t}. Martin's Lane, Charing Cross, by M^{r}. George Faulkner in Essex Street, Dublin. *A Paris chez le S^{r} le Rouge Ingenieur Geographe du Roy de France.*" There are 52 plates in this collection.

1751. Universal Magazine of Knowledge and Pleasure. 8 × 7. Scale, 5 miles = 1 inch.

Map with plain ruled border, with degrees and minutes of latitude and longitude, giving main and some cross roads, towns, villages, and a few hamlets, with scattered trees and hills very

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slightly indicated. At the top, outside the border, "Engrav'd for the Universal Magazine," and at the bottom, "Printed for J. Hinton at the Kings Arms in St Pauls Church Yard." In the left-hand top corner, in scrolled escutcheon, "Hertford Shire Drawn from an Actual Survey," and to the right an "Explanation," with list of the principal indications and signs employed on the map. On the left-hand side, towards the bottom of the map, a small circular indicator of the points of the compass showing the N. and E. At the bottom of the map, in the middle, a scale of miles, and in the right-hand bottom corner, in an ornamental escutcheon, a hart lying down to left, and beneath it "The Arms of Hertford."

In 'An Account of the County of Hertford, commonly called Hertfordshire. With a new and accurate Map, drawn from the best Authorities and latest Surveys,' in vol. viii (January part) of 'The Universal Magazine of Knowledge and Pleasure,' a monthly publication, which ran from June, 1747, to December, 1803 (113 vols.), and was continued in a new series from 1804 to 1814 (21 vols.), and as 'The New Universal Magazine' for two more volumes; the whole, London, 8vo. In 1792 another description and Map of the County of Hertford occur.

1751. Bickham, George. 5¾ × 9.

Bird's-Eye View Map of Hertfordshire of this date. This is an idealized view of Hertfordshire looking north, as if seen from a considerable eminence on the borders of Middlesex, with a tree, an ass ladened with firewood, and two figures in the foreground. Along the top of the plate, "A Map of Hertford Shire north from London. Humbly Inscrib'd to the R^{t} Hon^{ble} the Earl of Essex Lord Lieutenant of this County." At foot a statement of the distances between some of the principal towns, and below, "According to Act of Parliament by G. Bickham, 1751."

This impression of the map differs from that published in 1796 by the absence of the words "Part of" which appear in the latter plate above the word "Middlesex" between the two figures in the foreground, as well as by alterations in the title, and in the text and date, etc., at foot. It is one of a series of engraved views of the counties dated on the plates variously from 1750 to 1754. They were incorporated in 'The British Monarchy: Or, a New Chorographical Description of all the Dominions subject to the King of Great Britain . . . .' which consisted, in its earlier editions, of engraved sheets of descriptions in written character only. The earliest title-page I have seen is one dated October 1st., 1743, but this is bound up with one of October 2nd., 1747, and in the same copy is also a title-page dated March 29th., 1750. Other early copies of this work in the British Museum have title-pages dated October 1st., 1748, and December 2nd., 1749.

It seems probable that these descriptions in sheets (which are continuously paged, and are printed on one side of the paper only, and appear to have been attempted in the first instance as examples of fine penmanship, Bickham being a writing master and engraver,

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and the most celebrated penman of his time) were collected into a folio volume after their completion, and reprinted in that form at various dates from 1743 to 1750; and that, subsequently, when the series of views had been all engraved, these views were bound up with the descriptive sheets and re-issued about 1754 (q.v. *post*, p. 198), although I have seen no fresh title-page of that date. The views were reprinted, without the descriptive text, in 1796, with a new title, 'A Curious Antique Collection of Bird's-Eye Views of the several Counties in England and Wales. . . . .' London, folio.

(Reprinted about 1754 and in 1796.)

*** 1753. Rocque, John.** 7⅛ × 6$\frac{1}{16}$. Scale, 5 miles = 1 inch.

A reprint of the map of Herts first found in 'The English Traveller' of 1746, but with the scale altered to one of 6 instead of 5 miles, and showing 5 miles instead of 4 to the inch. The plate seems otherwise unaltered.

From 'The Small British Atlas: Being a New Set of Maps of all the Counties of England and Wales': "London. Published according to Act of Parliament, 1753. By John Rocque, Chorographer to his Royal Highness the Prince of Wales, near Old Round Court in the Strand, and Robert Sayer, Map and Print Seller, at the Golden Buck, opposite Fetter Lane, Fleet Street." Obl. 4to.

There is a duplicate title in French.

This collection contains 54 maps in all (2 of England, 38 of the English Counties, 3 of the Ridings of Yorkshire, 8 of the Welsh Counties, and 3 of the Islands).

The first map, "a Parliamentary Map of England," larger than the others, and folding, has in the margin a table of "The Produce of the Land Tax at 4 Shillings P. Pound iv Guliel. et Ma: as also of the Ship Money," showing the amounts for each county, a table of the "Three Shilling Aid" of the year 1699, and other printed matter, and is dated 1753 at foot. The maps in this edition are not numbered on the plate. (Reprinted 1762 and 1764 (?); the maps were also reprinted in 1769 in 'England Displayed.')

*** 1753. Moll, Herman.** 10$\frac{1}{16}$ × 7¼. Scale, about 3½ miles = 1 inch.

A reprint of Moll's Map of Herts of 1724, but with the coins cut off the plate. The map itself is unaltered, except that it is numbered in the margin in the left-hand top corner "(20)" instead of "(18)."

From Moll's 'British Atlas, or Pocket Maps of all the Counties in England and Wales.' 1753, sm. folio. There are 51 maps in this Atlas.

*** 1753. Camden, William.** 17¾ × 14½. Scale, about 2 miles = 1 inch. Drawn by Robert Morden.

The Map of Herts of 1695 as altered in the reprint of 1722.

From the third edition of the '*Britannia*' by Gibson. 2 vols. London, 1753, folio.

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*** 1754 (c). Bickham, George.** 5¾ × 9.

Bird's-Eye View Map of Hertfordshire. An impression of the view described under the date 1751 (*ante*, p. 196).

From 'The British Monarchy: Or, a New Chorographical Description of all the Dominions subject to the King of Great Britain. . . . And enlarging more particularly on the respective Counties of England and Wales.' "Engrav'd by George Bickham," London, sm. folio.

The British Museum copies of this publication are ascribed to 1743, 1748, and 1749 respectively, but for the reasons stated at pp. 196, 197 (1751, Bickham, G.) it seems probable that the complete work (including the maps) was issued about or after 1754. There are various title-pages, variously dated from 1743 to 1750, but at the end of the engraved text, at the foot of p. 188, we find "Finis. G. B. Fecit, 1749." This suggests that this part of the work was completed at the date mentioned. The first of the maps, that of the British Dominions, appears to be of 1749. The county maps are in a few cases undated, but the rest are dated in a series of six or eight in each year from 1750 to 1754 (inclusive). They are, mostly, engraved by George Bickham, senior, but six are signed by George Bickham, junior.* While the Map of Herts is amongst those dated 1751, and may probably have appeared separately at that time, the work as a whole cannot, consistently with the dates on the latest of the maps, have been issued earlier than 1754.

*** 1759. Owen, John.** 4⅛ × 4¼. Scale, 10 miles = 1 inch. Engraved by Emanuel Bowen.

Also from the '*Britannia Depicta*,' a further example of the fourth edition, from the original plates, identical in all respects with the issue of 1736, except for the alteration in the date. London, 1759, 8vo.

1760 (c). Kitchin, Thomas. 25¾ × 20¾. Scale, about 1½ miles = 1 inch.

Shows the hundreds, rivers, principal roads (with junctions of cross-roads, and distances between towns in miles), towns, villages, hamlets, houses and parks (with the names of owners or occupiers), churches (marked R. and V. to indicate whether the living is a Rectory or Vicarage, and with particulars of the ownership of the advowson in some cases), woods, wind- and water-mills, post-stages, charity schools, religious houses, and other details. There are a good many short historical notes on the map itself.† The border is double-ruled, with degrees and minutes of longitude and

* George Bickham the elder flourished 1709 to 1767, and died in 1769. He was a writing-master and engraver. His son, George Bickham the younger, was an engraver and political caricaturist. He is said to have died in 1758. See Strutt's 'Biographical Dictionary of Engravers,' London, 1785, 4to, and the 'Dictionary of National Biography,' vol. v, London, 1886, 8vo.

† One of these, that relating to Hitchin, is printed in the Introduction to this Catalogue, p. 7 *ante*.

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latitude marked. In the margin at foot towards the right-hand side of the map, "Longitude East from London."

In the left-hand top corner, in an ornamental, scrolled panel, surmounted with a coat of arms, bearing the motto "*Tuum est*," is a dedication "To the Noble and Right Honourable William Cowper, Earl Cowper, Lord Lieutenant and Custos Rotulorum of the County of Hartford, this Map is dedicated by His Lordships Most Obedient and humble servant Thos: Kitchin." In the extreme corner a note as to the orthography of the name of the county. To the right of the panel a list and biographical notes of the "Earls and Marquises of Hartford," and below a description of the town of "Hartford."

On the left-hand side of the map, to the west of the county boundary at Berkhamsted, is a circular indicator of the north, with the east indicated by a cross, and in the left-hand bottom corner a scale of (5) "Statute British Miles 69 to a Degree."

In the right-hand top corner is a long explanation of the signs, etc., on the map, and the whole margin in the right-hand bottom corner is filled with a design, consisting of an upright and ornamental stone panel, with the title of the map, and a stone trough and fountain, at which a lad is standing talking to a girl. In the distance groups of trees and water. In the foreground, on the right, a plough, and, on the left, standing corn and reapers, two men and two women, seated at a meal, one of the men drinking from a small barrel, the other holding a sickle. In the margin, "A. Walker, J. *Sc.*"

The title runs as follows: 'A New Improved Map of Hartfordshire from the Best Surveys and Intelligence, Divided into its Hundreds; Shewing the Several Roads, and true Measured Distances between Town and Town. Also the Rectories and Vicarages; the Parks and Seats of Nobility and Gentry; with other useful Particulars. By Thos: Kitchin, Geographer.'

From 'The Large English Atlas: or, a New Set of Maps of all the Counties of England and Wales, By Emanuel Bowen, Geographer to His Majesty, Thomas Kitchen [*sic*] and Others.' London, n.d., imp. folio.

There are 48 maps in this collection, including one of England and Wales, 37 of the English Counties, 3 of the Ridings of Yorkshire, 6 of Welsh Counties, and 1 of North Wales. They are all by either Bowen or Kitchin, except the following:—Gloucester and Monmouth in one map, no author's name; Middlesex, R. W. Searle; Westmoreland, no name; and North Wales, no name. In general they bear no date, but Norfolk is dated 1749, Berks, Bucks, Leicester and Rutland, and Worcester are 1756, Derbyshire is 1758, and Westmoreland 1760. The atlas, therefore, could not have been published prior to the last-mentioned date, to which one copy in the British Museum is ascribed in the Library Catalogue, although another is given as "*circâ* 1756." It seems safe to take the first issue of this atlas as having been about 1760. There were at least two others, distinguishable by the imprints on the title

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and on the maps, and slight alterations in the title itself. They were probably published in 1763 and 1785 respectively.

1760 (c). Gibson, John. $4\frac{7}{8} \times 2\frac{1}{2}$. Scale, 16 miles = 1 inch.

An outline map of Herts giving the rivers and roads and a few towns and villages only. In the right-hand top corner, "Hertfordshire," in a small scrolled panel. The left-hand top corner and margin are filled with description, and in the left-hand bottom corner is a scale of (10) "English Miles." In the right-hand bottom corner is a slight indicator showing the north and east—the north by a vertical line with ornamental arrow-head, and the east by a transverse line terminated by two small cross-bars. The longitude is E. and W. from London.

From an atlas entitled 'New and Accurate Maps of the Counties of England and Wales.' It is "Drawn from the latest surveys By J. Gibson, London. Printed for J. Newbery at the Bible and Sun in St. Paul's Churchyard." No date, 24mo. The date of issue is problematic. The only copy I have seen of this little atlas is one in the Gough Collection in the Bodleian Library.

Gibson engraved the map of England in Rocque's "Small British Atlas" (1753), also a set of pocket maps called the '*Atlas Minimus*,' which was improved by Bowen, and published (or republished) by the latter in 1758. This was again issued in 1792. Gibson's name also occurs on maps in Dury's small atlas issued about 1764.

The above atlas was perhaps earlier than 1760, but it is impossible to fix anything with accuracy in default of further information.

*** 1762. Rocque, John.** $7\frac{1}{2} \times 6\frac{1}{8}$. Scale, 5 miles = 1 inch.

A reprint of the map of Herts of 1753. This edition has the number 15 in the right-hand top corner, just above the border-line of the map. It is otherwise unaltered.

From an edition of 'The Small British Atlas,' a copy of which is in my collection, bearing the date 1762. The imprint is "London Published according to Act of Parliam^{t}. By John Rocque, Chorographer to his Majesty, near Old Round Court in the Strand, 1762." 8vo. It has also a duplicate title in French.

1763. Martin, Benjamin. $8\frac{5}{8} \times 6\frac{1}{2}$. Scale, 5 miles = 1 inch. Engraved by Emanuel Bowen, for W. Owen [1759].

Gives the hundreds (indicated by letters), the rivers and roads, with the distances between towns marked on the latter, the towns and a few villages, and hills and trees.

The meridian is marked in the margin. In the left-hand top corner, in a nearly oval escutcheon, slightly ornamented, "Hertford Shire Divided into its Hundreds: Containing the Borough and Market Towns, with the Rivers, Roads, distances, etc. By Eman: Bowen Geog^{r}. to His Majesty," and below an "Explanation" of the signs on the map. On the right-hand side is a circular indicator of the points of the compass, showing the N. and E. In

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the right-hand bottom corner is a list of the hundreds, and below, a scale of British statute miles. Below the margin of the map is "Engrav'd for the General Magazine of Arts and Sciences; for W. Owen at Temple Bar, 1759."

The map was printed in 1763 only, in the second of the two volumes entitled 'The Natural History of England,' London, 1759 and 1763, 8vo, which formed a section of the 'General Magazine of Arts and Sciences,' London, 1755–1765, 8vo.

*** 1763 (c). Kitchin, Thomas.** 25¾ × 20¾. Scale, about 1½ miles = 1 inch.

A reprint of the map of Herts in 'The Large English Atlas' of Bowen & Kitchin, first issued about 1760. London, n.d., imp. folio.

A copy in the British Museum Library is catalogued as of 1763, which is the date given by Gough in the 'Anecdotes' and 'British Topography' for the only copy of this Atlas which he mentions. There are 47 maps, including Scotland and Ireland, in the British Museum copy.

1764. England Illustrated. 9⅛ × 7⅛. Scale, about 5 miles = 1 inch. Engraved by Thomas Kitchin.

Gives the roads, towns, villages, houses, parks, with woods and hills. In left-hand top corner, in panel with ornamental border: "A New Map of Hertfordshire Drawn from the best Authorities: By Thoˢ Kitchin Geographer Engraver to H.R.H. the Duke of York," and to the right a star indicator of the points of the compass, within a circle. In the right-hand bottom corner: "Remarks:—Borough Towns with the Nº of Membʳˢ they send to Parliamᵗ by stars—Market Towns—Rectories and Vicarages—Parks—Places where Fairs are kept have a Line under the name thus," and, below, a scale of "British Statute Miles 69 to a Degree." In the bottom border: "Longitude West" and "East from London." A broken line is ruled vertically across the map on the meridian of London.

From 'England Illustrated, or, a Compendium of the Natural History, Geography, Topography, and Antiquities Ecclesiastical and Civil of England and Wales.' Printed for R. & J. Dodsley, 2 vols., London, 1764, 4to. The Hertfordshire map is in vol. i, at p. 303.

*** 1764. Owen, John.** 4⅛ × 4⅛. Scale, 10 miles = 1 inch. Engraved by Emanuel Bowen.

The last impression of the map of 1720, according to Gough's 'Anecdotes,' in which he states that the last edition of the '*Britannia Depicta*' was of this date. From the '*Britannia Depicta*' of Owen, London, 1764, 8vo.

*** 1764 (?). Rocque, John.*** 7¼ × 6. Scale, 5 miles = 1 inch.

* Rocque died before this date, as, in the title of 'A Collection of Plans of the Principal Cities of Great Britain and Ireland,' published by Dury in 1764, amongst the surveys from which the plans, etc., are drawn, "those taken by the late Mr. J. Rocque, Topographer to His Majesty," are mentioned.

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According to Gough, who sets out the title in full, with the above date, an edition of 'The Small British Atlas' was issued in 1764, but I have not seen a copy.

I have, however, seen impressions of Rocque's map of Herts of 1753 and 1762, which are numbered, one, within the plate at the top right-hand corner, 16, and another 24, which may either of them belong to the above edition of the Atlas.

1765. Kitchin, Thomas, and Emanuel Bowen.

I have not been able to identify the map of Herts which appeared in the Atlas referred to in the following extract from Gough's 'British Topography,' vol. i, pp. 98, 99:—"'The English Atlas, or a complete set of maps of all the counties in England and Wales, containing all the cities, towns, parishes, rivers, roads, seats, and in general every other particular that is usually sought for or to be found in maps. The whole engraved in the neatest and most accurate manner, from drawings after actual surveys, and other the best authorities, by Thomas Kitchen; Emanuel Bowen, geographer to his majesty; and others. Lond. 1765.' 4to., with a general description of the counties, and historical extracts relating to the trade, etc. etc. It consists of 47 maps, besides general ones of England, Scotland, and Ireland." It would seem to have been a reduction from the map in 'The Large English Atlas' of 1760, etc., by the same engravers.

It seems probable that this may be an early, and perhaps the first, edition of an atlas of which a copy exists in the Library of the Royal Geographical Society, in which the maps, by Emanuel Bowen, are most of them dated in 1777, and a few 1778. The map of Herts in this copy measures 20 × 16¼. Scale, 2 miles = ¼ inch. It is engraved by Emanuel Bowen, and bears the date June 1st, 1777. See *post*, pp. 207, 208, for description.

1766. Ellis, John. 9¾ × 7¼. Scale, 5 miles = 1 inch.

Gives roads, rivers, towns (distinguishing borough and market towns), villages, rectories and vicarages, fairs, hills, parks, and woods. Plain margin, with inner line divided into degrees and minutes of latitude and longitude. In left-hand top corner, on design of upright stone, with ornaments and a background of trees, "A Modern Map of Hartford-Shire, Drawn from the latest Surveys; Corrected and Improved by the best Authorities. J. Ellis, sculpt." and a circular indicator of the north. In the right-hand bottom corner "Remarks," showing the meaning of the signs used on the map, and, below, scale of "British Statute Miles 69 to a Degree." At foot, below margin, "Printed for Carington Bowles in St. Pauls Churchyard, and Robt Sayer in Fleet Street." The map is numbered 22 at the right-hand top corner. (Reprinted 1768, 1773, and 1777.)

From 'Ellis's English Atlas: or a Compleat Chorography of England and Wales: in Fifty Maps, Containing more Particulars than any other Collection of the Same Kind. The Whole Calculated for the Use of Travellers, Academies, and of all those who desire

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to Improve in the Knowledge of their Country. From the latest Surveys of the Several Counties; Engraved by, and under the Direction of, J. Ellis.'

This appears to be the first edition of the Atlas, London, 1766, long 4to. It is the only one mentioned in Gough's 'Anecdotes.' It is "Printed for Carington Bowles, next the Chapter-House, in St. Paul's Church-Yard; and Robert Sayer, at the Golden Buck, near Serjeants Inn, in Fleet-Street. Price 10*s.* 6*d.* in Red Leather for the Pocket. MDCCLXVI."

The only copy I have seen is one in the possession of Mr. Joseph Wilson, of Wakeley, Buntingford, Herts.

1766* (c). Dury, Andrew, and John Andrews.

28⅜ × 20¼ Scale, 1½ miles = 1 inch. This is the Index-map to the map next described.

It is divided into the hundreds, and shows the principal and cross roads, the rivers and streams, with towns and villages, and the hills and ranges of hills by shading, with the woods and principal seats. It is also divided by vertical and horizontal lines into nine sections corresponding to the sheets of the large map, and these are numbered as to the top and central sections 1 to 6 in the right-hand top corner of each section, and as to the bottom sections 7, 8, and 9 in the right-hand bottom corner. The margin is plain-ruled. In the left-hand top corner: "A Topographical Map of Hartford-Shire, Taken from an Actual Survey, As an Index to the Large One." In the left-hand bottom corner is a scale of seven miles.

Bound up in a large folio volume with the nine sheets of the large map, and plans of Hertford and St. Albans, the two latter dated 1766. (Reprinted in 1777 and 1782.)

1766* (c). Dury, Andrew, and John Andrews.

6 ft. 11½ ins. × 5 ft. 1 in. Scale, ½ mile = 1 inch.

A map in nine sheets in a plain-ruled border with degrees and minutes of latitude and longitude, bound in a large folio volume with Index-map and plans of Hertford and St. Albans. These two plans are by Andrews and M. Wren, and are dated 1766. The map is also found mounted in one sheet to fold into case.

It gives the parish boundaries (laid down in many cases very erroneously), and is elaborately engraved throughout, showing the arable fields, meadows, unenclosed lands, woods, commons, parks, and gardens, with houses and their ornamental surroundings, as well as the roads, rivers and streams, towns, villages, hamlets, hills, woods, churches, parsonages, turnpikes, wind- and water-mills, and other details. The names of the owners or occupiers of the principal seats are set out, as are also the distances on some of the main roads. The design is, here and there, but not in

* This is the date given for the maps in Gough's 'Anecdotes' (1768), 'Additions and Corrections,' at p. 713; and in his 'British Topography' (1780), vol. i, at p. 433.

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general, carried beyond the boundaries of the county. The sheets, including the border of the map, measure about 29 × 20 ins., and contain marginal ornamentation, titles, and particulars, as follows :—

Sheet 1 (forming left-hand top corner of the map). This sheet is nearly filled with a large engraving of a country scene about 19 × 14 ins. In distance, windmill on hill, house with portico front, field of waving corn, and hills; in middle distance, trees and hut on right, with fox running, and, in the centre, huntsmen and hounds. The foreground, divided from the rest of the picture by a river, has on the left a large tree, with cart, plough, and wooden harrow at its foot, and sheaves of corn, sickle, flail, spade, and basket on the ground near, and a man standing with a gun and dog looking at the hunt. Above is a large sheet hanging on left to the dead bough of a tree, and held up on the right by an angel, inscribed: "To the Right Hon^{ble} Anne Holles Capel, Earl of Essex, Visco^{t}. Malden, and Baron of Hadham in the County of Hartford, L^{d}. Lieu^{t}. and Cus. Rot. Com: Hart, etc. The Right hon^{ble} John, Earl of Bute Knight of the Most Noble Order of the Garter, and One of his Majesty's most hon^{ble} Privy Council, etc. etc. S^{r}. Lawrence Dundas, Bar^{t}., and those Gentlemen who have been pleased to Encourage this Undertaking; This actual Survey (as a Grateful Testimony of their Generous Assistance) is most humbly Inscribed By their Most Dutiful, and Devoted Servants And^{w}. Dury and Jn^{o}. Andrews."

Sheet 3 (forming right-hand top corner of map). In the top right-hand corner of the sheet is a large rectangular panel, containing the title of the map: "A Topographical Map of Hartford-Shire, From an Actual Survey; In which is Express'd all the Roads, Lanes, Churches, Noblemen and Gentlemen's Seats, and every Thing remarkable in the County: Together with the Divisions of the Parishes. By And^{w}. Dury, and Jn^{o}. Andrews."

Sheet 7 (forming left-hand bottom corner of map). Along bottom, on left, "Scales of British Miles 69½ to a Degree; of Miles 60 to a Degree; and of Perches or Poles," and in the margin: "Minutes of Longitude West from London." On the right: "Explanation," with designs corresponding to the engraved features of the map, showing—"Parish Towns, Villages, Roads enclosed by Hedges, Open Roads, Roads, one side enclosed by a Hedge, Water Mills, Rivers with Bridges, Wind Mills, Parks, Churches, Heaths or Commons, Hills, Kitchen Gardens, Ponds, Woods, Pasture enclosed by Hedges, Arable enclosed by D^{o}., and Marshes."

Sheet 8 (forming the centre of the bottom of the map) has in the centre, below margin: "Published according to Act of Parliament and Sold by A. Dury in Dukes Court near St. Martins Lane London. Price of the Map in Sheets 1£ 16*s*."

Sheet 9 (forming the right-hand bottom corner of the map). The space outside the county in this sheet is almost entirely filled by an elaborate indicator of the points of the compass, with a globe as centre upon a large star, the points of which are continued by radiating lines carried to the borders of the map and the county.

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The north of this indicator points a little to the east of the perpendicular of the map, and is inscribed along the line: "Minutes of Latitude agreeable to the Scale taken on the Perpendicular." In the bottom right-hand corner of the sheet are the following details, etc.:—"Hamlets belonging to Each Parish.

"Bovington a Hamlet belonging to Hemel-hemsted.

"Chevesfield a Do. belonging to Graveley.

"Pirton a Do. to Hitchin.

"Hippolites a Do. to Do.

"Lully a Do. to Ofley Mag.

"Nuthamsted a Do. to Barkway.

"Wakeley a Do. Self Dependent.

"Hoddesdon a Do. to Broxbourn.

"Broadfield a Do. to Cottered.

"N.B. The Western Part of this County from Chipping Barnet along the North Road, was Survey'd by Jn°. Andrews, the East Part by And^w. Dury, Etc."

And in the margin: "Minutes of Longitude East from London."

This map is coloured by parishes, by hand.

1767 (c). Bowen, Emanuel, and Thomas Bowen. 12¼ × 8¼. Scale, 4¼ miles = 1 inch.

A map of Herts very full of names and notes, following closely Kitchin's large map of 1760–63. It shows the hundreds, and all the same details as are found in that map. The border is plain, with double-ruled lines, with the degrees and minutes marked, and: "Longit. from London" between the lines at the foot. It is crossed by lines of latitude and longitude 5′ apart, broken in many places by the text of the names and notes. Outside the right-hand top corner, "No. 3." In the left-hand top corner a panel in scrolls, with title: "Hartford Shire Divided into Hundreds; Exhibiting the County and Market Towns Etc. with concise Historical Extracts, relative to its Natural Produce, Trade and Manufactures. Describing also the Church Livings; with Improvements not Inserted in any other Set of Half Sheet County Maps Extant. By Eman: Bowen Geographer to His late Majesty." To the right of this panel is an "Explanation," showing the signs used on the map. Below is printed the same note on the orthography of the name Hertford, or Hartford, as occurs on the large map of 1760–63, and, again below, on the intersection of two meridian lines, is a circular indicator of the points of the compass. Below this, again, are, in descending order, historical notes on Hitchin and Abbot's Langley, and, in the left-hand bottom corner, a scale of (12) "British Statute Miles." On the right-hand side of the map the margin is nearly filled with similar notes on Hartfordshire, Hartford, St. Albans, Ware, and Bishop Stortford. (The last four are printed in the Introduction, at p. 7 *ante*.)

From the '*Atlas Anglicanus*, Or a Complete Sett of Maps of the Counties of South Britain.' "By the late Emanuel Bowen, Geographer to His Majesty George II^d, and Thomas Bowen. Printed for T. Kitchin, No. 59 Holborn Hill." London, n.d., fol.

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This collection contains 2 maps of England and Wales, 38 maps of the English Counties, 3 of the Ridings of Yorkshire, and maps of North and of South Wales, making 45 in all.

As Emanuel Bowen died in 1767, and is described in the title as "The late," the Atlas must have been issued not earlier than in that year. Thomas Bowen died in 1790.*

Gough, in 'British Topography,' vol. i, at p. 99, after particulars of the 'English Atlas' by Kitchin & Bowen, London, 1765, 4to, continues: "The Royal English Atlas, by the same hands, consists only of 44 maps; and a general one of England, smaller folio, to be had singly for a shilling, and the others for eighteenpence. Mr. Bowen, reduced by family extravagances, and almost blind through age, had begun to engrave them on a long quarto, in eighteen-penny numbers of three maps each; but, dying May 1767, before he had finished above three or four numbers, they were continued by his son."

*** 1768. Ellis, John.** 9¾ × 7⅝. Scale, 5 miles = 1 inch.

An exact reprint of the map of Herts in the Atlas of 1766. From 'Ellis's English Atlas.' London, 1768, long 4to. Apparently the second edition. It is printed for Robert Sayer, Thomas Jefferys, and A. Dury.

*** 1769. England Displayed.** 7½ × 6$\frac{1}{16}$. Scale, 5 miles = 1 inch. Engraved by John Rocque.

This is Rocque's map of Herts as found in his 'Small British Atlas' (1753, etc.), unaltered. From 'England Displayed, being A New, Complete, and Accurate Survey and Description of the Kingdom of England, and Principality of Wales.' "By a Society of Gentlemen." 2 vols., London, 1769, fol.

*** 1772. Camden, William.** 17¾ × 14½. Scale, about 2 miles = 1 inch. Drawn by Robert Morden.

Another reprint of the map of Herts in the first edition of Gibson's Camden, with the slight alteration which appears in 1722. From the fourth and last edition of the '*Britannia*,' by Gibson, 2 vols., London, 1772, folio.

*** 1773. Ellis, John.** 9¾ × 7⅝. Scale, 5 miles = 1 inch.

Another unaltered impression of the map in the Atlas of 1766, but folding in the middle.

From 'Ellis's English Atlas,' London, 1773, 8vo. This appears to be the third issue. It is printed for Robert Sayer alone. In the copy in the British Museum a folding chart of distances on the plan of Norden's is inserted, but it is not referred to in the list of maps, and does not seem to belong to the Atlas. It has "P. Luckombe *Fecit* 1775" in one corner.

*** 1777. Ellis, John.** 9¾ × 7⅝. Scale, 5 miles = 1 inch.

A further reprint of the map of Herts first published in 1766.

From 'Ellis's English Atlas,' London, 1777, 4to. The fourth and last edition, it seems. The maps are not folded.

Printed for R. Sayer and J. Bennett.

* Dict. of Nat. Biography, vol. vi.

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*** 1777. Dury, Andrew, and John Andrews.** 28⅜ × 20¼. Scale, 1½ miles = 1 inch. The Index-map to the large map of this date.

Printed from the same plate as the map ascribed to 1766, but with the design filled in with many additional names of places, hamlets, etc., and with those of the owners of estates. At the right-hand bottom corner, in one line on the margin, is added: "London, Published as the Act directs Feby 1st. 1777 by Andrew Dury, Duke's Court, St. Martin's Lane."

*** 1777. Dury, Andrew, and John Andrews.** 6 ft. 11¼ ins. × 5 ft. 1 in. Scale, ½ mile = 1 inch.

An unaltered impression of the large map of Herts in nine sheets, ascribed to 1766 [with, no doubt, the addition of the date and publisher's name in the title, as in the Index-map of this date].

*** 1778 (c). Bowen, Emanuel.** 20 × 16¼. Scale, 2 miles = ¼ inch.

A reprint of a map of Herts which was, apparently, first issued in 'The English Atlas' of Kitchin & Bowen in 1765, and may probably have been reprinted at other dates. It has a ruled border showing the degrees and minutes of latitude and longitude, with lines across the map at a distance of 5′ apart. In bottom margin: "Longitude from London." Below map on margin of plate: "No. 16," and: "London, Printed for Robt. Sayer and John Bennett, No. 53 Fleet street, John Bowles, No. 13 Cornhill, and Carington Bowles, No. 69 St. Pauls Church Yard, as the Act directs 1st of June, 1777." [There is a copy in Mr. Evans' collection (Herts County Museum) which bears an imprint, without date, of R. Sayer & J. Ryall, T. Bowles, J. Bowles & Son, Bakewell & Parker, H. Overton, and T. Kitchin.]

Shows the hundreds, roads (with distances in miles), towns, villages, and many other details, and many notes, historical and others, on the map. All the margins, also, are filled with notes.

In the left-hand top corner is a large ornamented escutcheon, with view of cottage, fish, a plough, basket with fowls, and sheaves of corn below it, and bearing: "An Accurate Map of Hartford Shire Divided into Hundreds; Drawn from Surveys and Illustrated with Historical Extracts relative to its Natural Produce, Trade and Manufactures; Describing also the Church Livings, Charities Schools Etc. with other improvements By Eman: Bowen Geogr. to his late Majesty." To the right of this panel is a note on the town of Hertford, and one on the orthography of the name. Down the left-hand side of the map (in one column) is a long list of the seats of the nobility and gentry, and, in the lower left-hand corner, are a globe-indicator of the points of the compass, with a large cross on the left-hand side,* a note on St. Albans, and a scale of miles. In the right-hand top corner are notes on Hitchin and Bishop's Stortford, and in the bottom corner on the same side,

* A curious perversion of the old custom of marking the East by a cross pointing to Jerusalem.

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historical notes on the Earls and Marquises of Hartford (1100 to 1749), an "Explanation," and a note on the county. These notes and the materials generally are those of Bowen & Kitchin's earlier maps (q.v.).

From a large atlas of county maps, of which I have examined a copy in the Library of the Royal Geographical Society, entitled: 'The English Atlas; or a set of Maps of all the Counties of England and Wales.' London, n.d., folio.

This Atlas is "Sold by R. Martin, Bookseller, No. 47, Great Queen Street Lincoln's-Inn Fields." The maps in it are all dated June 1, 1777, except Devonshire, Hereford, Leicester and Rutland, and Worcester, which are January 1, 1778, and Essex, Gloucestershire, Kent, Sussex, and S. Wales, which are undated. If these are original dates of the first impressions of the plates, the Atlas cannot have been issued before 1778 (but see 1765, Kitchin & Bowen, p. 202 *ante*).

*** 1782. Dury, Andrew, and John Andrews.** 28¾ × 20¼. Scale, 1½ miles = 1 inch. The Index-map to the reprint of the large map of the same date.

A reprint of the Index-map of 1766, as amended in 1777, but with the imprint altered to "London, Published as the Act directs Feb^{y} 1st, 1782, by W^{m} Faden Charing Cross."

*** 1782. Dury, Andrew, and John Andrews.** 6 ft. 11½ ins. × 5 ft. 1 in. Scale, ½ mile = 1 inch.

An unaltered reprint of Dury & Andrews' large map of Herts, in nine sheets, first issued in 1766, with the addition in the title of "London, Publish'd Jan^{y} 1st, 1782, by W^{m} Faden Charing Cross."

1784. Walpoole, George Augustus. 6$^{5}/_{16}$ × 7¾. Scale, about 6 miles = 1 inch. Engraved by T. Conder.

Shows rivers, main roads, towns, villages, with the parks and a few trees and hills. The degrees and minutes of latitude and longitude are marked in a plain, double-lined border. In the margin at foot is: "Meridian of London." In the left-hand top corner, "Remarks," with signs for boroughs, etc., as indicated on map, and, below, a circular indicator of the points of the compass with a cross to the right. In the left-hand bottom corner a shield with double indentation at the top, bearing a hart lying down to left. In the right-hand bottom corner, on an upright square-cut stone, standing on a low wall, with a sheaf of corn lying on the top, and trees and farm buildings and a man reaping in a cornfield in the distance: "A New Map of Hartford Shire, Drawn from the Latest Authorities." In the centre of the bottom of the map a scale of "British Statute Miles." Below the map: ["Published by Alex^{r}. Hogg at the] Kings Arms, No. 16 Paternoster Row" and "T. Conder, *sculpt.*" *

Cut from a sheet of two maps, Beds and Herts, facing p. 186 in

* In a copy in the British Museum the engraver's name is omitted, and there is added along the top of the two maps: "Engraved for Walpoole's New and Complete British Traveller."

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'The New British Traveller; Or, A Complete Modern Universal Display of Great-Britain and Ireland:' London, 1784, fol.

The description of Herts in this work runs from pp. 211 to 215.

*** 1785. Bowles, Carington.** 12¾ × 8¼. Scale, 4½ miles = 1 inch.

A reprint of Emanuel Bowen's map of Herts in the '*Atlas Anglicanus*,' with the title altered by the erasure of the panel in the left-hand top corner of the map and the insertion in its place of a plain circle containing: "Bowles's New Medium Map of Hartford Shire, Divided into its Hundreds; Exhibiting the Roads, Towns and Villages, with their Distance from London, Church Livings, Seats of the Nobility, and Historical Remarks. London: Printed for the Proprietor Carington Bowles, No. 69 in St. Pauls Church Yard." The indicator of the points of the compass on the left-hand side of the map, which in the '*Atlas Anglicanus*' is a plain circle, is here filled up with a star. Below the margin, in the centre, is added: "Published as the Act directs, 3 Jan. 1785." There is also the number 16 in the margin of the plate in the top right-hand corner in lieu of "No. 3" which occurs in the former impression. Otherwise the map is unaltered.

From 'Bowles's New Medium English Atlas; or, Complete Set of Maps of the Counties of England and Wales.' There are forty-four maps in this collection, including a general map of England and Wales. London, 1785, 4to.

There is another impression of this map: "Printed for the Proprietors Bowles & Carver," which is not dated at foot, and no doubt belongs to a re-issue of the above-mentioned atlas, at a date which I have no means of fixing, as I have not seen such an atlas, and my only authority for its existence is the map in the collection of Mr. Lewis Evans (Herts County Museum).

1785 (c). Bowles, [Carington ?]. 7½ × 6. Scale, 7 miles = 1 inch.

A map of Herts, in the collection of Mr. Lewis Evans, in a plain double-ruled border, with the degrees marked and the lines of 52° N. latitude and 0° longitude carried across the map, showing rivers, roads, towns, villages, parks, trees, and hills. At the top, in a narrow strip outside the border: "Bowles's Reduced Map of Hartfordshire"; and in the right-hand corner the number 25. In the left-hand top corner is: "Min^{s} West Longitude from London"; and below: "Remarks," with details of the signs shown on the map. In the left-hand bottom corner a scale of (8) "British Statute Miles." At the right-hand top corner, a star-indicator of the north in a circle, with a cross on the right-hand side (east), and at the bottom corner on the same side: "Min^{s} East Long^{e}."

This map is, no doubt, from another atlas, smaller than the 'New Medium English Atlas,' issued by Carington Bowles about the same time as the latter, but I have not seen a copy.

*** 1785 (c). Kitchin, Thomas.** 25¾ × 20¾. Scale, about 1½ miles = 1 inch.

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Kitchin's large map of Herts as reprinted in an edition of the 'Large English Atlas' of Kitchin & Bowen, ascribed to the above date in the catalogue of the British Museum Library. This atlas is "Printed and sold by Robert Wilkinson at No. 58, in Cornhill, successor to Mr. John Bowles, deceased." London, n.d., large folio.

***1786 (?). Boswell, Henry, and Robert Hamilton.** 9 × 7. Scale, 5 miles = 1 inch. Engraved by Thomas Kitchin.

A reprint of the map of Hertfordshire in the 'London Magazine' of 1748, with the omission of the indication at foot: "London Mag: for May, 1748."

From the 'Historical Descriptions of New and Elegant Picturesque Views of the Antiquities of England and Wales,' London, n.d., folio; but the frontispiece is "Published according to Act of Parliament by Alex^r Hogg, Nov. 25, 1786."

This is a thick folio volume of about 520 pages, but it is unpaged, and each description is given, generally, on a separate sheet, so that the whole could be arranged and bound up according to the fancy of the subscriber. The preface says of the maps: "The elegant County-Maps, Etc. will be found very useful Illustrations; they will also be executed in a masterly and ornamental Manner, and will prove a valuable Acquisition to Purchasers of every Denomination."

1787. Cary, John. 10¼ × 8 7/16. Scale, about 4½ miles = 1 inch.

A finely drawn and clear map of Herts in plain, double-ruled border, with the degrees and minutes of longitude and latitude shown. In the bottom margin on left, "Longitude W^st. from S^t Pauls London," and on right, "Longitude E^st. from S^t Pauls London," and outside border at foot, "London: Published as the Act directs Sep^r. 1st. 1787 by J. Cary, Engraver, Map and Printseller the corner of Arundel Street Strand."

The map itself gives the rivers, with the Grand Junction Canal, main and cross roads (the former with the miles from London marked in figures), and the towns, villages, hamlets, houses, parks, woods, commons, some other minor details, and the particulars of the directions of the principal roads where they leave the county. In the left-hand top corner is a delicately-designed and shaded star-indicator of the north, crossed horizontally by a long shaded band or panel, bearing: "Hertfordshire." Below it, curved: "By John Cary Engraver," and below, again, a "Scale of (10) Miles 69½ to a Degree of Latitude." This map is interesting as being the earliest on the meridian of St. Paul's, London. It is a good example of Cary's fine and careful work.

From 'Cary's New and Correct English Atlas: being A New Set of County Maps from Actual Surveys. Exhibiting All the Direct and principal Cross Roads, Cities, Towns, and most considerable Villages, Parks, Rivers, Navigable Canals Etc.' "London. Printed for John Cary, Engraver, Map and Print seller, the corner of Arundel Street, Strand. Published as the Act directs Sept^r. 1st. 1787, large 4to."

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This is the earliest of Cary's atlases. It is dedicated to Lord Weymouth, and contains a general map of England and Wales, 40 maps of the English Counties, 3 of the Ridings of Yorkshire, and one each of North and South Wales—46 in all. The maps are printed each on one leaf with a page of descriptive text to face. They are all dated September 1st, 1787.

(Reprinted in 1793, and again without date, but "corrected to 1818," with the maps undated.)

*** 1787 [1774]. Grose, Francis.** 5⅛ × 4¾. Scale, 8 miles = 1 inch. Engraved by John Seller [1695 ?].

An impression of Seller's small map of Herts of 1695 (?) and 1701, with the title altered, and the names of two of the towns near the old title erased.

This map occupies slightly more than the upper half of a small folio (or large octavo) page, with below, a descriptive text headed "Hertfordshire," continued on the back, and ending nearly at the bottom of this page with a list of "Antiquities in this County worthy notice." From vol. ii (1774) of 'The Antiquities of England and Wales,' by Francis Grose, Esq., F.A.S., in four volumes, 1773–76, with a supplement in two volumes, 1777–87, all London, sm. folio. This work, though published between 1773 and 1787, according to the dates on the frontispieces and title-pages, contains in each volume engravings of later dates up to 1787. It seems as if an original title-page had been prepared and dated for each volume—vol. i, 1773; vol. ii, 1774; vol. iii, 1775; vol. iv, 1776; supplement, vol. i, 1777; vol. ii, 1787; and that, subsequently, all the volumes had been made up as the plates accumulated, so that the volumes were none of them bound up *before* 1787. The map of Herts in vol. ii is associated with engravings of St. Albans Abbey and other local antiquities, engraved in and dated 1787.

There is another edition of this work in eight volumes, 1783–1787 (including a supplement of one volume), 4to. In this edition the map of Herts is also in vol. ii, which is not dated, but may be referred nominally to 1784, as it contains engravings of Hertford Castle and the Rye House bearing that date. The first volume contains plates dated as late as 1787, but on the first title-page the work is described as a "New Edition," and dated 1783. Then, on a second title-page (dated 1784), it is called "The Second Edition, Corrected and enlarged."

It seems impossible to bring into any harmony the various dates found in these two complete series of Grose's great work. The issues must have been made up and published to a large extent contemporaneously, and, of course, out of the same materials. Grose was extremely particular in dating every plate he published, and he even issued an accompanying list of plates, showing in each case the date on which the sketch was made from which the corresponding plate was engraved. Thus we know that his work of collecting materials for the 'Antiquities' began as far back as 1760 and 1761, the dates of several of the Bedfordshire sketches,

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though the engravings from these drawings are not dated until many years afterwards (1772, 1773, and even 1787). There are many sketches made as late as 1787, so that it seems that Grose was busy accumulating pictorial materials for twenty-eight years (1760–1787). The work of engraving commenced in 1772, and was completed in 1787, thus itself extending over no less than sixteen years. We know nothing of Grose's reasons for using Seller's plates for his maps, which he does throughout both issues. They do not appear to have been re-used between 1701 (Camden's '*Britannia* Abridg'd') and this date, and were, of course, quite obsolete.

1788. Political Magazine. 12¾ × 10¼. Scale, 4 miles = 1⅛ inch. Engraved by John Lodge.

Shows rivers, principal roads, towns, villages, hamlets, parks, woods, and hills. Plain-ruled margin, with degrees and minutes of latitude and longitude. Meridians of 52° N. latitude and 0° longitude of London ruled across map. In left-hand top corner: "A Map of Hartfordshire, from the latest Authorities." In the right-hand top corner, a small circular indicator of the north, and in the right-hand bottom corner: "Remarks," and, below, scale of (10) "British Statute Miles 69 to a Degree." On bottom border, within map, on left, is: "Longitude West from London," and on right, "Longitude East from London," and in margin, "Meridian 0 of London."

At the right-hand top corner, outside border: "Political Mag. Oct^{r} 88," and, below, in middle, "London Published as the Act directs, Oct^{r} 31st 1788 by J. Murray, No. 32 Fleet Street."

From 'The Political Magazine, and Parliamentary, Naval, Military, and Literary Journal,' 21 vols., London, 1780–91, 8vo. The map of Herts illustrates vol. xv (June–December, 1788).

Other county maps in the series have at foot "J. Lodge *sc.*" (The maps are reprinted in an atlas, without title or date, about 1795.)

1789. Camden, William. 19⅝ × 15¾. Scale, about 2 miles = 1 inch. Engraved by John Cary.

Map with a plain, ruled border, divided into degrees and minutes of latitude and longitude. In bottom margin, on left, "Longitude West from St. Pauls, London," and on right, "Longitude East from St. Pauls, London." Meridian 0° ruled across map, and passing about a mile west of Hertford. Shows hundreds, main and cross roads, rivers, towns, villages, hamlets, houses, mills, parks, many woods, and hills. The distances are marked in miles from London on the principal roads. In the left-hand top corner, "A Map of Hartfordshire from the best Authorities," and, "Engraved by J. Cary." In the right-hand bottom corner, a star-indicator of the points of the compass, and a "Scale of Miles 69½ to a Degree of Latitude."

From the '*Britannia*,' translated from Camden's edition of 1607 by Richard Gough, the first edition, 3 vols., London, 1789, fol. The map of Herts is found in vol. i, facing p. 335. (Reprinted in the 2nd edition, 1806.)

(*To be continued.*)

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CONTENTS :

	PAGES
Title Page, Table of Contents, etc.	1
Index, etc.	245
List of Members	1

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The objects of the Society are:—1. The investigation of the Meteorology, Geology, Botany, Zoology, Ethnology, Pre-Norman Archæology, and Topography of the County of Hertford. 2. The publication of the results of such investigation made by its Members. 3. The dissemination amongst its Members of information on Physics and Biology. 4. The formation of a Library of works on Natural History, and of a Museum illustrative of the Geology, Botany, and Zoology of the County. 5. The discouragement of the practice of removing rare plants from the localities of which they are characteristic, and of exterminating rare birds, fish, and other animals.

Evening meetings of the Society are held in the rooms of the Watford Urban District Council (Upton House) once a month during the Winter and Spring. Evening meetings are also held occasionally at St. Albans, Hertford, and other places. Field meetings are held during the Spring and Summer in various parts of the County.

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XXI.

METEOROLOGICAL OBSERVATIONS TAKEN IN HERTFORDSHIRE IN THE YEAR 1902.

By John Hopkinson, F.L.S., F.G.S., F.R. Met. Soc., Assoc. Inst. C.E.

The Hertfordshire meteorological stations for the year 1902 are the same as before, and the observations have been taken as usual. The hour of observation is 9 a.m. All the records are entered to the same day except those of the maximum temperature and the rainfall, which are entered to the previous day. Shade temperatures only are given; for Bennington, Berkhamsted, and St. Albans from thermometers in Stevenson screens, and for New Barnet from thermometers under a Glaisher stand.

Information as to the stations is given in my paper on "The Climate of Hertfordshire," and particulars as to the averages with which the results are compared are given in my previous report. (See pp. 125–126 and 145 of this volume.)

Table I.—*Results of Climatological Observations taken in Hertfordshire in the Year* 1902.

Stations	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Bennington	47·7	40·8	54·6	13·8	16·1	83·0	82	7·6	17·94	185
Berkhamsted	48·0	40·5	55·6	15·1	14·0	83·9	82	7·5	20·11	167
St. Albans	48·0	41·4	54·6	13·2	15·0	83·3	82	7·2	21·24	169
New Barnet	48·1	38·8	57·3	18·5	7·0	84·8	82	6·8	20·47	149
County.....	48·0	40·4	55·5	15·1	7·0	84·8	82	7·3	19·94	168

In the year 1902 the mean temperature was 0·3° below the average of that of the twelve years 1887–98. The mean daily range was 0·8° below the average of that of the five stations from the returns of which the mean for that period was deduced, owing entirely to the lower temperature of the days. The air, at 9 a.m., was of average humidity. The sky, at the same hour, was considerably more cloudy than usual. The sun shone on the average for nearly an hour a day less than usual. The rainfall was small, but there was more than the average number of rainy days. Westerly winds greatly prevailed, and south-westerly were the next in frequency.

Compared with the average, January was a very warm month, and March was also warm; May was very cold, and so was February, being 6° colder than January and nearly 10° colder than March; and June also was cold. The air was very humid

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in February and very dry in July. The sky was exceptionally cloudy in May and October. Very little rain fell in January and April; June was a wet month and August was very wet. Rain fell on a small number of days in January, July, and September, on a large number in June and August, and on a very large number in May.

TABLE II.—*Means of Climatological Observations (with Extremes of Temperature) for the Seasons of* 1901–1902.

Seasons	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Winter	37·3	32·0	42·6	10·6	7·0	56·8	90	7·2	5·82	37
Spring	46·0	37·2	54·8	17·6	21·5	71·9	78	7·1	4·43	48
Summer	58·7	49·3	68·0	18·7	34·1	84·8	73	7·0	7·69	46
Autumn	49·2	42·0	56·4	14·4	18·8	75·1	87	7·4	4·38	39

The Winter of 1901–2 (Dec. to Feb.) was of average temperature, that of neither the days nor the nights differing appreciably from the average. The air was of average humidity, and the sky of average brightness. The duration of sunshine averaged 5 minutes a day less than usual. The rainfall was about the average, but the number of wet days was rather less than usual. The prevailing direction of the wind was from the south-west and west.

The Spring (March to May) was rather colder than usual, owing chiefly to the coldness of the days, the mean daily range of temperature being rather small. The air was of about average humidity; the sky was rather cloudy. The duration of sunshine averaged about 20 minutes a day less than usual. The rainfall was rather small, but on a large number of days. Westerly winds prevailed, south-westerly being the next in frequency.

The Summer (June to August) was cold, owing much more to the coldness of the days than to that of the nights, the mean daily range of temperature being less than the average. The air was rather drier, and the sky was rather more cloudy than usual. The sun shone on the average nearly an hour and a half a day less than usual. The rainfall was a little above the average, and on a large number of days. Westerly winds prevailed, south-westerly being the next in frequency.

The Autumn (Sept. to Nov.) was of average temperature, the nights being a little warmer and the days a little colder than usual, the mean daily range of temperature therefore being rather small. The air was of about average humidity; the sky was much more cloudy than usual. The sun shone three-quarters of an hour a day on the average less than usual. The rainfall was very small, and so was the number of rainy days. The prevailing direction of the wind was easterly (N.E., E., and S.E.).

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TABLE III.—*Means of Climatological Observations (with Extremes of Temperature) taken at Bennington, Berkhamsted, St. Albans, and New Barnet, during the Year* 1902.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	40·2	35·1	45·4	10·3	16·3	54·0	88	7·4	·80	9
Feb.	34·2	28·8	39·5	10·7	7·0	54·0	93	7·4	1·20	11
March	43·9	35·7	52·1	16·4	21·5	63·5	86	7·2	1·53	14
April	46·0	36·6	55·3	18·7	24·0	67·9	74	6·5	·75	12
May	48·1	39·2	57·0	17·8	24·0	71·9	74	7·7	2·15	22
June	56·8	47·7	65·9	18·2	34·1	83·0	73	7·0	3·03	17
July	60·0	50·0	69·9	19·9	36·0	84·8	69	6·6	1·18	10
August	59·2	50·1	68·3	18·2	38·8	80·5	78	7·3	3·48	19
Sept.	55·7	46·5	64·9	18·4	30·0	75·1	80	5·8	1·09	9
Oct.	48·8	42·2	55·3	13·1	26·0	66·3	88	8·0	1·48	16
Nov.	43·2	37·4	49·0	11·6	18·8	61·6	92	8·5	1·81	14
Dec.	39·6	35·4	43·8	8·4	20·0	58·1	89	7·7	1·44	15
Year	48·0	40·4	55·5	15·1	7·0	84·8	82	7·3	19·94	168

JANUARY.—A very warm month, less humid and more cloudy than usual, with a very small rainfall on a small number of days. Both days and nights were warm, the mean minimum and mean maximum temperatures being each about four degrees above the average. The duration of sunshine was rather longer than usual. The prevailing direction of the wind was westerly, south-westerly winds being next in frequency. The weather was very warm for the first twelve days, rather colder from the 13th to the 19th, again very warm from the 20th to the 24th, and colder for the last week. The maximum temperature exceeded 50° on the first four days, on the 9th and 10th, and on the 21st and 22nd; and the minimum only sank below 32° on ten days at Berkhamsted and twelve at St. Albans.

FEBRUARY.—Very cold, with a very humid atmosphere, rather more cloudy than usual, and with a rather small rainfall on the usual number of days. The low temperature was due much more to the coldness of the days than to that of the nights, the mean daily range being small. The duration of sunshine was shorter than usual. North-easterly winds prevailed, but not to any great extent; the next in frequency were south-easterly. The last week only was warm, the temperature never falling below 32°, while it fell below this point every day for the first three weeks. There was a "glazed frost" or "silver thaw" on the night of the 2nd, fine sleet and rain freezing on reaching the ground.

MARCH.—A warm month, with a humid atmosphere, a cloudy sky, and about an average rainfall on the usual number of days. The temperature of the days was rather more in excess of the

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TABLE IV.— *Climatological Observations taken at* BENNINGTON HOUSE, BENNINGTON. *Latitude:* 51° 53′ 45″ N. *Longitude:* 0° 5′ 20″ W. *Altitude:* 407 *feet. Observer:* REV. J. D. PARKER, LL.D., F.R.Met.Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	40·0	35·4	44·6	9·2	23·0	52·9	88	7·8	·60	13
Feb.	34·1	29·3	38·9	9·6	16·1	51·9	93	7·5	·91	10
March	43·8	36·4	51·1	14·7	29·3	59·0	86	7·7	1·18	17
April	45·8	37·2	54·5	17·3	30·0	65·8	78	7·0	·67	13
May	47·9	39·5	56·2	16·7	28·7	69·3	73	8·5	2·10	23
June	56·6	48·3	64·9	16·6	36·0	79·7	73	7·1	2·64	20
July	59·4	50·4	68·5	18·1	41·8	83·0	69	6·7	1·46	10
August	58·9	50·4	67·3	16·9	42·7	77·2	76	7·1	3·16	20
Sept.	56·1	47·8	64·4	16·6	37·7	71·7	80	6·6	1·34	12
Oct.	48·4	42·4	54·4	12·0	33·1	63·8	89	8·4	1·26	17
Nov.	42·8	37·8	47·8	10·0	24·8	59·2	94	8·6	1·28	13
Dec.	39·0	34·9	43·1	8·2	20·7	55·9	89	7·7	1·34	17
Year	47·7	40·8	54·6	13·8	16·1	83·0	82	7·6	17·94	185

TABLE V.— *Other Meteorological Observations taken at Bennington by the Rev. Dr. Parker.*

Months	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	30·183	38·5	37·1	40·3	41·0	3	17	60	6·7	11
Feb.	29·914	32·6	32·0	35·4	36·4	4	17	70	8·2	11
March	·882	43·0	41·2	42·4	42·5	1	12	100	9·3	3
April	·992	47·0	43·9	46·1	46·0	5	14	162	13·0	0
May	30·000	48·6	44·6	49·5	49·2	0	13	136	11·0	0
June	29·955	58·6	53·9	57·9	56·8	6	14	169	14·6	3
July	30·055	60·5	55·1	62·5	62·4	6	14	156	13·3	2
August	29·966	59·5	55·5	60·6	60·4	1	14	110	8·8	3
Sept.	30·106	56·3	53·2	57·8	58·5	7	12	141	10·0	2
Oct.	·024	48·4	46·9	50·7	51·9	3	16	46	7·0	14
Nov.	29·933	42·3	41·6	45·0	46·4	0	18	40	6·6	14
Dec.	30·082	39·1	37·8	40·9	42·1	1	19	25	4·3	20
Year	30·008	47·9	45·2	49·1	49·5	37	180	1215	14·6	83

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TABLE VI. — *Climatological Observations taken at* ROSEBANK, BERKHAMSTED. *Latitude:* 51° 45′ 40″ N. *Longitude:* 0° 33′ 30″ W. *Altitude:* 400 *feet. Observer:* EDWARD MAWLEY, F.R.Met. Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	40·4	35·3	45·5	10·2	21·1	52·2	89	7·9	·81	8
Feb.	34·4	29·2	39·5	10·3	14·0	52·2	95	7·6	1·41	14
March	44·2	36·3	52·2	15·9	24·7	62·0	86	7·7	1·59	13
April	45·8	36·4	55·2	18·8	29·0	65·0	73	6·6	·91	13
May	48·4	39·7	57·0	17·3	28·7	70·0	74	7·9	2·20	21
June	56·7	47·8	65·7	17·9	34·1	82·9	73	7·2	2·70	17
July	59·7	49·6	69·8	20·2	38·4	83·9	68	6·5	1·05	10
August	58·9	49·9	67·9	18·0	42·2	77·2	79	7·7	3·40	19
Sept.	55·7	46·2	65·2	19·0	34·4	73·4	80	5·6	·64	7
Oct.	48·9	42·1	55·6	13·5	30·1	64·0	88	8·3	1·65	15
Nov.	43·4	37·7	49·2	11·5	25·8	61·6	94	8·9	2·26	15
Dec.	39·9	35·9	43·9	8·0	21·0	55·7	89	7·8	1·49	15
Year	48·0	40·5	55·6	15·1	14·0	83·9	82	7·5	20·11	167

TABLE VII. — *Other Meteorological Observations taken at Berkhamsted by Mr. Mawley.*

Months	Pressure of the atmosphere	Temperature at 9 a.m.				Days of		Bright Sunshine		
		of the air	of evaporation	of the soil		clear sky	overcast	Total hours	Max. in one day	Sunless days
				at 1 ft.	at 2 ft.					
	ins.	°	°	°	°					
Jan.	30·173	38·6	37·3	39·4	40·9	3	16	53	6·6	13
Feb.	29·886	32·0	31·6	34·6	36·6	5	17	52	6·9	13
March	·857	42·8	41·0	42·8	43·2	1	3	99	8·8	7
April	·966	47·0	43·1	47·4	47·3	5	10	152	13·3	2
May	·984	48·7	44·8	50·9	50·8	0	12	157	11·6	4
June	·929	58·3	53·8	59·3	57·8	5	11	164	14·1	5
July	30·044	60·8	55·2	63·6	63·5	5	8	178	13·5	2
August	29·943	59·3	55·8	61·3	61·4	1	10	133	10·5	3
Sept.	30·087	56·2	53·1	58·5	59·8	10	9	159	10·6	1
Oct.	·003	48·9	47·2	50·7	52·8	3	16	65	8·5	7
Nov.	29·901	42·6	41·9	44·6	47·1	0	16	42	6·3	14
Dec.	30·062	39·4	38·1	40·1	42·2	2	19	31	5·4	19
Year	29·986	47·9	45·2	49·4	50·3	39	154	1285	14·1	90

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average than that of the nights, the mean daily range being considerable. There was much less sunshine than usual. The prevailing direction of the wind was from the south-west and west. On only nine days at Berkhamsted and twelve at St. Albans did the maximum temperature not reach 50°; and on only six days at Berkhamsted and five at St. Albans was the minimum below 32°. On the 17th, at Berkhamsted, "the temperature in the thermometer-screen rose to 62°, a reading," Mr. Mawley says, "which has only once before in the last sixteen years been exceeded so early in the spring." The same reading was again reached on the 31st.

APRIL.—Of average temperature, with a dry atmosphere, a sky of average brightness, and a very small rainfall but the usual number of wet days. Both the night and day temperatures, and therefore the mean daily range also, were about the average. The duration of sunshine was about the same as usual. North-easterly winds prevailed, but were closely followed by southerly. The temperature sank below 32° on two days, the 7th and 9th, at St. Albans, and on four, the 3rd, 7th, 9th, and 14th, at Berkhamsted. Towards the end of the month there was very dry and bright weather. For the six days ending 28th the average duration of sunshine at Berkhamsted was "10¾ hours a day, and on the last of those days the record reached 13¼ hours, making this," Mr. Mawley says, "the sunniest April day" he had recorded there.

MAY.—Very cold, with an atmosphere of average humidity, a very cloudy sky, and a rainfall only slightly exceeding the average but on an exceptionally large number of days. The temperature of the days was more exceptionally low than that of the nights, the mean maximum temperature being more than 5° below the average. The mean daily range was therefore very small. The sun shone on the average for about an hour a day less than usual. The prevailing direction of the wind was from the west, but northerly and north-westerly winds were also frequent. Except at New Barnet, rain was recorded on all but three of the first twenty-two days, and it also fell on the last three or four days in the month. The only warm period was in the dry interval between the 22nd and 28th.

JUNE.—Another cold and gloomy month, with an atmosphere of about average humidity, a rather cloudy sky, and a heavy rainfall (about one inch or 50 per cent. above the average) on a large number of days. The days were again much colder in comparison with the average temperature than were the nights, the mean daily range being small for the month. The duration of sunshine was much smaller than usual. The wind came mostly from opposite points of the compass, east and west, easterly winds being slightly the more frequent. The month may be divided into two periods of very different character, the first twenty days being cold, wet, and gloomy, and the last ten days warm, dry, and bright. In the latter period rain fell on two or three days to the aggregate amount of from 0·03 to 0·06 in.

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TABLE VIII.—*Climatological Observations taken at the* HERTFORDSHIRE COUNTY MUSEUM, ST. ALBANS. *Latitude:* 51° 45′ 15″ N. *Longitude:* 0° 19′ 56″ W. *Altitude:* 389 *feet. Observer:* JOHN HOPKINSON, F.R.Met. Soc.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	40·0	35·0	44·9	9·9	23·3	51·8	87	7·5	·84	8
Feb.	34·2	29·5	38·9	9·4	15·0	49·9	93	7·3	1·22	13
March	43·9	36·5	51·4	14·9	25·7	60·4	86	7·0	1·73	13
April	45·9	37·8	54·0	16·2	29·8	66·5	72	6·6	·78	13
May	47·7	40·0	55·3	15·3	30·5	67·1	74	7·3	2·05	23
June	56·6	48·7	64·5	15·8	35·8	80·3	72	6·8	3·34	17
July	60·0	51·1	68·8	17·7	42·5	83·3	70	6·7	1·17	10
August	59·1	51·4	66·9	15·5	42·8	77·0	78	7·2	4·15	20
Sept.	55·8	48·2	63·4	15·2	40·7	72·2	80	5·4	1·08	8
Oct.	48·8	43·5	54·2	10·7	36·6	63·7	87	8·1	1·62	16
Nov.	43·7	38·5	48·8	10·3	26·4	58·9	92	8·4	1·84	15
Dec.	39·9	36·1	43·7	7·6	20·1	56·3	88	7·7	1·42	13
Year	48·0	41·4	54·6	13·2	15·0	83·3	82	7·2	21·24	169

TABLE IX. — *Climatological Observations taken at the* GAS WORKS, NEW BARNET. *Latitude:* 51° 39′ 5″ N. *Longitude:* 0° 10′ 15″ W. *Altitude:* 212 *feet. Observer:* T. H. MARTIN, Assoc. M. Inst. C.E.

Months	Temperature of the Air						Humidity	Cloud, 0–10	Rain	
	Means				Extremes				Amount	Days
	Mean	Min.	Max.	Range	Min.	Max.				
	°	°	°	°	°	°	%		ins.	
Jan.	40·6	34·7	46·5	11·8	16·3	54·0	87	6·4	·93	8
Feb.	34·1	27·4	40·9	13·5	7·0	54·0	90	7·1	1·27	8
March	43·3	33·7	52·9	20·2	21·5	63·5	84	6·3	1·63	12
April	46·7	34·9	57·6	22·7	24·0	67·9	75	5·8	·63	9
May	48·7	37·7	59·7	22·0	24·0	71·9	73	7·1	2·23	21
June	57·1	45·9	68·4	22·5	34·5	83·0	73	7·0	3·44	16
July	60·7	48·8	72·6	23·8	36·0	84·8	71	6·4	1·04	10
August	59·9	48·8	71·0	22·2	38·8	80·5	78	7·1	3·20	18
Sept.	55·3	43·9	66·7	22·8	30·0	75·1	81	5·6	1·30	8
Oct.	48·9	40·7	57·1	16·4	26·0	66·3	88	7·3	1·39	14
Nov.	42·8	35·6	50·0	14·4	18·8	60·5	90	8·2	1·88	12
Dec.	39·7	34·9	44·5	9·6	20·0	58·1	88	7·8	1·53	13
Year	48·1	38·8	57·3	18·5	7·0	84·8	82	6·8	20·47	149

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JULY.—Rather cold, with a very dry atmosphere, a sky of average brightness, and a small rainfall on a rather small number of days. The temperature of both nights and days was about equally below the average. The average duration of sunshine was much less than usual. Westerly winds prevailed, closely followed by south-westerly and then north-westerly. The rainfall was about half the average. Up to the 19th there were only two days of rain since the 1st, and four since the 22nd of June. The first half of the month was much the warmer. There was a severe gale on the 26th. Considerable damage was done to trees in St. Albans and its neighbourhood; several were uprooted at Sandridge; and at Windhill, near Bishop's Stortford, a large plane-tree was snapped in two about a foot from the ground.

AUGUST.—Rather cold, with a rather humid atmosphere, a cloudy sky, and a heavy rainfall on a large number of days. The temperature of both nights and days was about equally below the average. There was a very small record of sunshine. South-westerly and westerly winds prevailed. The rainfall was 50 per cent. above the average. Although many days were wet, heavy falls accounted for most of the rain, and were more frequent than in any other month in the year. On the 18th and 19th the fall was exceptionally heavy at Watford, an inch and a half of rain being gauged on the two days, and during a thunderstorm on the latter day the rain fell for an hour in such quantities that the low-lying districts were flooded.

SEPTEMBER.—Rather cold, with a rather dry atmosphere, a bright sky, and a small rainfall (less than half the average) on a small number of days. The temperature of both nights and days was about equally below the average. The duration of sunshine was about the average. There was no considerable preponderance of winds from any quarter, but north-westerly, northerly, and southerly winds were the least frequent. This is the third month in succession with both the mean maximum and mean minimum temperatures about a degree below the average. The last half of the month was almost rainless. There was a small fall on the 16th, after which the only rain recorded at our four stations was 0·01 in. at Bennington, 0·01 in. at St. Albans, and 0·002 in. at New Barnet, none falling at Berkhamsted.

OCTOBER.—Rather mild, with an atmosphere of average humidity, a very cloudy sky, and a small rainfall (about half the average) on the usual number of days. The nights only were warmer than usual, the days being of average temperature; the mean daily range was therefore less than usual. There was very little sunshine, its duration being only about half the average. The wind came most frequently from the north-east, south-west, and west. The first seven days were cold, with scarcely any rain, the next nine days were warm, with rain on six or seven, and the last fifteen days were of about average temperature, with rain on more than half the number. Between the 16th of September and the 9th of October the rain recorded at Bennington was 0·06 in. on

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four days; at Berkhamsted, 0·03 in. on three days; at St. Albans, 0·06 in. on two days; and at New Barnet, 0·002 in. on one day only.

NOVEMBER.—Of average temperature, with a humid atmosphere, a very cloudy sky, and a rather small rainfall on nearly the average number of days. The temperature of both nights and days was about the average. The duration of sunshine was rather less than usual. Easterly and south-easterly winds prevailed in equal proportion, and more than twice as frequently as from any other point of the compass. The first half of the month was much warmer than the second half, in which there were five very cold days, 18th to 22nd, with the minimum temperature below 32° every night, and the maximum never reaching 42°. At no other time was the minimum below 32° except on the 13th at Berkhamsted (35° at St. Albans).

DECEMBER.—Very mild, with an atmosphere of average humidity, a rather cloudy sky, and a small rainfall on about the average number of days. The excess in temperature was due almost entirely to the warmth of the nights (about 3° above the average); the mean daily range was therefore very small. There was much less sunshine than usual even for this, the least sunny month in the year. Westerly winds greatly prevailed, the next in frequency being from the north-east and south-west. The only cold period was from the 4th to the 13th. During this period the minimum temperature was only once above 32° (on 10th). On no other occasion did it sink below 32° at St. Albans, and only on the 3rd at Berkhamsted. The maximum was below 32° on the 6th at St. Albans, and on the 5th and 6th at Berkhamsted. The 6th was much the coldest *day* on the whole in the year, the 9 a.m. temperature at St. Albans being only 20°·2, but there was a much lower *minimum* in February.

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XXII.

NOTES ON THE HABITS OF SOME OF OUR LEPIDOPTEROUS INSECTS.

By Arthur Cottam, F.R.A.S.

I.—The Butterflies.

Read at Watford, 16th December, 1902.

The Lepidoptera, which are commonly known as butterflies and moths, are scale-winged insects, deriving their name from two Greek words—*lepis*, "a scale," and *pteron*, "a wing."

However carefully a butterfly or a moth may be handled, it is impossible to avoid rubbing off a little of what is commonly called the "dust" that covers its wings. This dust is the scales, which, if examined with a microscope or a strong magnifying lens, are seen to be of beautiful and very various forms, and many of them brilliantly coloured. The scales are placed upon the wings like the tiles on the roof of a house, each row overlapping the row below it, the highest row being at the base of the wing next the body of the insect, and the lowest row on the hind margin forming an exquisite fringe. Taking advantage of this arrangement it is possible, if an insect has in any way got dusty, to brush the wings, if the brush is carefully passed outwards from the base of the wings, without rubbing off any of the scales. Brush the wings the other way and you will utterly spoil the beauty of the insect.

I am frequently asked, What is the difference between a butterfly and a moth? And very hazy notions seem generally to prevail as to how to distinguish them. So far as our British species are concerned there is no difficulty. They are distinguished by the structure of the antennæ, as those horn-like organs are called which are placed upon the head just above the eyes. In the butterflies these are clubbed, and the butterflies are therefore called Rhopalocera, which means club-horned. The antennæ of moths are never clubbed. They are very various in form and structure, some being hooked, some, like the thong of a whip, getting thicker to the middle and then tapering to a point, others are beautifully feathered, and some are comb-like. The moths are therefore called Heterocera, variously horned.

What is the use of the antennæ is not certainly known; so far as one can see, the insects appear to make little or no use of them, but they are supposed to be organs of feeling, and possibly in flying they may help to direct the course of the insect. My own idea is that they are the organs by which insects smell. This sense is developed to a very high degree in all insects, whereas they appear to be perfectly deaf. No noise will disturb them.

The Rhopalocera or butterflies form a very small portion of our Lepidoptera. The lists give 65 or 66 British species, but of these six are not believed to breed in this country, although they are occasionally, and some of them are frequently, taken here. Two

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have become extinct in Britain. One of these, the large copper, has become extinct altogether, as it was an exclusively British insect. It disappeared about fifty years ago, when Whittlesea Mere was drained.

Our moths number over 2,000 species.

So much for general remarks upon the Lepidoptera. Now I will describe some of the habits of the butterflies, which will be sufficient for one paper.

The butterflies—like all insects—pass through the four stages of (1) egg or ovum, (2) caterpillar or larva, (3) chrysalis or pupa, (4) perfect insect or imago. In the egg and chrysalis states they are quiescent, and the only things to note about them are the positions in which they are found, which depends as to the eggs upon the habits of the female of the perfect insect, and as to the chrysalis upon the habits of the caterpillar.

One curious habit of many of the larvæ is that they make their first meal upon the shell of the egg from which they have just emerged. Most larvæ, when they begin to feed on their proper food-plant, grow rapidly, especially those which hatch out in Spring or Summer. As they grow they change their skin, and the number of moultings is usually four or five. Many larvæ are different in colour and markings with each moult. The larva stage is, of course, that of feeding and growth, and it can be well understood that a caterpillar grows fast when I tell you that it will usually eat about fourteen times its own weight of food in a day. When full fed it changes into a pupa, and the manner of effecting this change varies. In the genera *Papilio* and *Pieris*, which are represented in our British insects by the swallow-tail, and whites, orange-tip, clouded yellows, and brimstone butterflies, the larvæ spin a little silken girdle to the stem of the food-plant (usually), then fasten the tail to the same stem a little lower down, put the head through the little girdle, and change to a pupa with the head upwards, the body being supported by the girdle. But by far the most usual position of butterfly pupæ is suspended by the tail, head downwards. The larvæ of all the *Vanessæ* and fritillaries change to a pupa in this position.

Most larvæ feed solitarily, but many are gregarious, and some spin a web in which they all live and feed together, moving to another branch and spinning a fresh web when they have stripped the first of its leaves. Among the butterflies in several species of the genus *Vanessa* the larvæ are gregarious; for instance the peacock, both the tortoise-shells, the Camberwell beauty, and the comma, but the painted lady and red admiral are exceptions to this rule.

There is one very curious habit of the larvæ of the peacock butterfly. They are black and covered with spines, and I daresay many of you have seen them feeding gregariously covered with a considerable web on the tops of stinging-nettles, but when full fed the larvæ scatter, and where they go to is not known. One day a bunch of nettles may be seen covered with them, and the

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next day they will have all disappeared. You will not be able to find one anywhere, and where they pupate is hardly known. In confinement, when they cannot get away, they pupate hanging to the underside of the stems of their food.

The hairstreaks (*Thecla*) mostly change to a pupa suspended by the tail and a silken girth to the underside of a leaf of their food-plant, or rather tree, for most of them are tree-feeders. The purple hairstreak (*T. quercus*) pupates, unlike the rest of the genus, underground, unattached and without a cocoon. The green hairstreak (*T. rubi*) pupates on the surface of the ground amongst the roots of the broom, its food-plant. One of the satyrs, the grayling (*Satyrus semele*), pupates in a slight cocoon just below the surface of the ground.

Although not an invariable rule, it is frequently the case that the larvæ of the species forming a genus all feed on the plants belonging to some particular order or genus. For instance, our Pieridæ all feed on plants of the order Cruciferæ; the Lycænidæ (the blues and the coppers) almost all feed on Leguminosæ; the species of *Argynnis* (the fritillaries) all feed on various species of *Viola*; and the Satyridæ (the meadow-browns, heaths, etc.) feed on various grasses. The Hesperidæ (skippers) feed between leaves of their food-plants, which they fasten together with silk, the larvæ usually changing to pupæ in these little domiciles.

The habits of the butterflies in the matter of hybernation are very curious. One would hardly think that a soft, fleshy, and usually ravenous creature like a caterpillar would be able to live through a severe Winter, and yet it is the fact that a larger number of our butterflies pass the Winter in the larval state than in any other. A few hybernate in the egg state, some as pupæ, and a good many in the perfect state. The swallow-tail and the white butterflies hybernate as pupæ. Some of the satyrs do the same, and some of them partly as larvæ and partly as pupæ. The brimstone butterfly (*Gonepteryx rhamni*) and all the *Vanessæ* hybernate in the perfect state, the brimstone among dead leaves at the foot of trees. The underside has a wonderful likeness to the leaf of a lime-tree. The *Vanessæ* hybernate in hollow trees, and often in houses and other buildings. It is not an uncommon thing to see a small tortoise-shell butterfly sitting in the corner of a bedroom near the ceiling all the Winter.

The hairstreaks remain in the egg state during the Winter, and the high brown fritillary does the same, but the other fritillaries all hybernate in the larval state. So do most of the blues. The hybernation of the Bedford blue, our smallest butterfly, is very curious. The larva, which is hatched at the beginning of July, feeds through that month; it then retires to the underside of some neighbouring object and remains there without change during the rest of the Summer, the Autumn, and the Winter, and changes into a pupa in May. It therefore remains in the larval state for ten months, and during nine of them is in a dormant condition. The larvæ of the fritillaries usually retire into their hybernacula

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when quite young; that of the silver-washed fritillary (*A. paphia*) emerges in August, and after eating its egg-shell hybernates without taking any other food, and begins to feed after hybernation at the beginning of April.

There are two broods in the year of several of our butterflies, among them the common blue, the Clifden blue, the holly blue, and the brown argus, and several of the Satyridæ, while there are three broods of the small copper.

The instinct of the females of insects that enables them to lay their eggs on the plant or plants which their larvæ will feed upon has always seemed to me to be one of the most wonderful things in nature. Mr. Tutt thinks that they discover the proper plant by scent. It is very interesting to watch a female of the brimstone, for instance, as I have often done in Bricket Wood, picking out the trees of *Rhamnus frangula* and laying her eggs singly.

In some double-brooded species the food-plant of the two broods is different. For instance, the holly blue; the females of the Spring brood, which is out in April, lay their eggs on the buds and blossoms of the holly, while those of the Autumn brood lay their eggs in July or August on the blossoms and young shoots of the ivy. The butterflies of the two broods are exactly alike in appearance, although reared upon different plants. Some butterflies lay their eggs singly when the caterpillars are solitary feeders; others lay them in batches if their larvæ are gregarious. The eggs are usually attached to the plant by some glutinous substance, but one of our butterflies, the marbled white, drops her eggs loose among the grass upon which the larvæ feed.

No butterfly lives for a year, and very few for more than a few months at the outside.

The species which probably lives longest as a butterfly is the brimstone. It emerges from the pupa in July or August, and after about a month settles down for hybernation. It comes out often during the Winter on warm, sunny days, and appears on the wing again in March. This species does not pair till the Spring after hybernation, and I have often seen them still out quite late in June, having probably lived as butterflies for eleven months.

The only food which butterflies can take is the honey from flowers. They have a proboscis, a sort of hollow tongue which is rolled up when not in use between the palpi, beneath the head. It seems wonderful that a butterfly can exist, and for the most of its life in vigorous flight, upon so small an amount of sustenance.

I cannot do better than conclude with an account of some most interesting observations which Mr. Frohawk has been making upon the Camberwell beauty (*Vanessa antiopa*), one of our rarest butterflies. At long intervals it appears in considerable numbers, and then is hardly seen for years, though it will occasionally turn up singly in all sorts of places all over England. It is, of course, a common species on the Continent, and from Mr. Frohawk's experience there seems to be no reason why it should not breed and be common here. We have at present only the first portion

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of his account, which is published in the 'Entomologist' for the present month (Dec., 1902).

He obtained some living examples of the butterfly from a friend at Hyères. He placed them on living plants of willow, covering the plants with gauze. He watched one female lay 192 eggs in one batch which encircled the stem. He had five females, and between them they laid over 2,000 eggs (about 2,200 as well as he could count them), so that the complement of eggs laid by each female numbers between 400 and 500. The eggs were all laid in batches of 150 to 250, each female laying three or more batches. The larvæ when hatched immediately start spinning a carpet of silk as they crawl away. They all, he says, did precisely the same, and formed a colony on the last cluster of leaves, feeding in company.

Mr. Frohawk describes their proceedings and changes to the third moult, and the rest of his account will appear in a future number of the 'Entomologist.'

This butterfly, like the other *Vanessæ*, hybernates in the perfect state, and has been known to hybernate in this country.

It has been frequently noticed that insects are more abundant in a Summer following a hard Winter, and I think this may be caused by hybernating larvæ being kept by the cold in a dormant condition, whereas if we get a spell of warm weather (as we occasionally do) in February, some of them are tempted to become active before there is any food for them to eat, and are consequently starved, and die. One or two of the larvæ of our grass-feeding butterflies will come out in any mild weather during the Winter and nibble a little food, and then with the cold become dormant again, but I do not think this is the case with many.

I ought to apologise for the fragmentary and rather disconnected character of these notes, but they have been put together at intervals of leisure as I could find time to write them. I can claim no originality for them, as I have gathered most of my information from Barrett's splendid work on our 'British Lepidoptera' and from Tutt's 'British Butterflies'; and I ought perhaps to apologise for the elementary character of some of the notes.

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XXIII.

REPORT ON THE RAINFALL IN HERTFORDSHIRE IN THE YEAR 1902.

By JOHN HOPKINSON, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

FOR the year 1902 the alterations in the staff of our observers result in a gain of three on the number for the previous year, the losses being two and the gains five. Fairhill, Berkhamsted, disappears from the list owing to the observer having left the county; and the return received for the Colne Valley Water Works, Watford, has had to be omitted owing to errors in the record which led to the discovery that the gauge leaked. The gains are Wigginton Vicarage; Frogmore, St. Albans; Weetwood, Watford; Feilde's Weir, Hoddesdon; and Hadley, Barnet. Wigginton Vicarage takes the place of Fairhill, Berkhamsted, leaving the number of rainfall stations in the river-district of the Bulbourne the same as before; and Weetwood, Watford, takes the place of the Colne Valley Water Works, making no difference in the number of Lower Colne stations. Frogmore, St. Albans, adds one station to those in the Ver district; and Feilde's Weir and Hadley add two to the Lower Lea stations.

These alterations result in the principal table containing the records of 48 stations, a number which has not before been exceeded, and has only once (in 1898) been equalled. The number of daily records received is 40, which is four more than for any previous year. For fulness of detail supplied the year is therefore a record one.

Particulars of the 48 rainfall stations, and the monthly and total rainfall and number of days of rain in 1902, are given in Tables I and II, pp. 229–231.

A supplementary table (Table III, p. 232) gives fourteen other records of the total rainfall in the year. Two are records of additional gauges at Rothamsted, four are those of additional gauges at Odsey, Rosebank and Rose Cottage, Berkhamsted, and at Weetwood, Watford, and eight are from 'British Rainfall, 1902.'

The mean rainfall in Hertfordshire in the year 1902 was 20·12 inches. This is 4·66 ins. below the average for the decade 1890–99, and 6·03 ins. below that for the 60 years 1840–99. The mean number of wet days in the year was 162, being 5 less than the average for the thirty years 1870–99, and 24 more than that for the previous year, when the rainfall exceeded that of 1902 by 1 inch. Last year was therefore one of very small rainfall of frequent occurrence in relation to the amount which fell.

Droughts in 1902.—Only one drought is recorded in the year, an "absolute" one (that is a period of more than 14 days without rain) in September–October, and it appears in the returns from a few stations only. Its period, according to the records from these stations, was for 15 days, Sept. 16–30, at one station; for 15 days, Sept. 24–Oct. 8, at two stations; for 16 days, Sept. 17–Oct. 2, at two stations; for 18 days, Sept. 13–30, at one station; for 18 days, Sept. 17–Oct. 4, at three stations; and for 20 days, Sept. 15–Oct. 4,

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at one station. A careful examination of the returns from the stations recording this drought, and a comparison with the returns from neighbouring stations, lead to the inference that small falls of rain (one or more) may have escaped notice, there having possibly been no actual "absolute" drought.

Distribution of the Rainfall throughout the Year.—Of the total rainfall of 20·12 inches, 7·86 fell during the six winter months and 12·26 during the six summer months. During the first quarter of the year 3·31 ins. fell, during the second quarter 5·95 ins., during the third quarter 6·31 ins., and during the fourth quarter 4·55 ins. During the Winter of 1901–2 (Dec. to Feb.) 5·56 ins. fell, during the Spring (March to May) 4·42 ins., during the Summer (June to August) 8·05 ins., and during the Autumn (Sept. to Nov.) 4·40 ins. In relation to the average, January and October were very dry months; April, July, September, and November were dry; February and December were rather dry; and June and August were wet, having together nearly one-third of the year's fall.

The difference in each month from the mean for the 60 years 1840–99 was as follows:—Jan., — 1·51 in.; Feb., — 0·47; March, — 0·13; April, — 0·93; May, + 0·18; June, + 0·90; July, — 1·01; August, + 1·19; Sept., — 1·14; Oct., — 1·44; Nov., — 0·89; and Dec., — 0·68.

The absolute maximum falls in any one day in each month, and the stations recording them, were—Jan. 1, London Orphan Asylum and Frogmore, Watford, 0·30 in.; Feb. 24, Great Gaddesden, 0·43 in.; March 14, Moor Park, Rickmansworth, 0·78 in.; April 5, Moor Park, 0·34 in.; May 30, Much Hadham, 1·11 in.; June 13, London Orphan Asylum, Watford, 1·09 in.; July 1, Hamels Park, Buntingford, 1·64 in.; August 6, Odsey, 1·33 in.; Sept. 11, High Down, Hitchin, 2·21 ins.; Oct. 17, Gorhambury Park, St. Albans, 0·58 in.; Nov. 29, Rose Cottage, Berkhamsted, 0·49 in.; Dec. 14, Wigginton, and Dec. 17, Moor Park, 0·40 in.

The day in each month on which a heavy fall of rain was most general over the county was—Jan. 1 (nearly equalled by the 4th and 26th), Feb. 24, March 14, April 5, May 22, June 13, July 1, August 10, Sept. 11, Oct. 17, Nov. 29, Dec. 17; and in the year March 14, nearly equalled by Feb. 24 and Oct. 17.

The first half of the year had the same number of days of rain as the second half, namely 81. There were 32 in the first quarter of the year, 49 in the second, 37 in the third, and 44 in the fourth. During the Winter of 1901–2 there were 35 wet days, during the Spring 45, during the Summer 45, and during the Autumn 39.

The average number of wet days in each month was as follows:—Jan., 9; Feb., 11; March, 12; April, 11; May, 22; June, 16; July, 10; August, 19; Sept., 8; Oct., 17; Nov., 14; Dec., 13.

The deviation from the mean for the 30 years 1870–99 was—Jan., — 6; Feb., — 2; March, — 1; April, — 2; May, + 10; June, + 4; July, — 4; August, + 5; Sept., — 5; Oct., + 1; Nov., — 2; Dec., — 3.

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TABLE I.—HERTFORDSHIRE RAINFALL STATIONS, 1902.

	STATION.	OBSERVER or AUTHORITY.	Diameter of Gauge.	Height of Gauge above		
				Ground.		Sea-level.
			ins.	ft.	ins.	ft. +
1.	Royston—Melbourne Street	Joseph E. J. Phillips	8	0	11	201 T
,,	*Odsey	H. George Fordham	5	1	0	256 ↑
2.	*Baldock—High Street	F. W. Langston Day	5	1	0	214 ↑
3.	*Preston—The Laburnums	R. de V. Pryor	8	2	6	480 ↑
,,	Hitchin—The Firs	William Lucas	5	2	1	238 ↑
,,	,, The Maples	William Hill	8	1	1	220 T
,,	* ,, The Chilterns	Francis Ransom	5	0	9	300 ↑
,,	* ,, High Down	Joseph Pollard	5	1	1	422 ↑
4.	Tring—Pendley Manor	J. G. Williams	5	2	0	500 ?
,,	,, Bulbourne	Gordon C. Thomas	5	2	3	401
6.	Wigginton Vicarage	Rev. H. J. E. Burrell	5	1	0	710 ↑
,,	Cowroast	Gordon C. Thomas	5	3	8	394 ↑
,,	* ,, Offside Cottage	Richard Leah	5	1	6	400
,,	*Berkhamsted—Rosebank	Edward Mawley	8	1	0	401 ↑
,,	* ,, Rose Cottage	W. E. Milner	5	1	0	334 ↑
7.	*Great Gaddesden Vicarage	Rev. W. T. T. Drake	8	1	0	427 ↑
,,	*H. Hempstead—Apsley Mills	J. Dickinson & Co.	24	0	9	260
8.	*Kensworth—The Grove	Miss S. Grace Jones	5	1	5	630 B
,,	*Harpenden—Rothamsted	A. D. Hall	5	0	9	420 T
,,	*St. Albans—Gorhambury	W. Newberry	5	1	0	423 T
,,	* ,, Herts County Museum	John Hopkinson	5	1	0	389 T
,,	* ,, Bone Hill	H. J. T. Broadwood	5	1	0	336 ↑
,,	*Frogmore—The Cottage	A. B. Lipscomb	5	0	10	218
9.	*Elstree—Aldenham House	Edwin Beckett	10 sqr.	4	9	305
10.	*Watford—Weetwood	John Hopkinson	5	1	0	269 ↑
,,	* ,, Lond. Orph. Asylum	Dr. O. C. Cockrem	5	1	1	231 T
,,	* ,, Frogmore	Arthur P. Blathwayt	5	1	0	182 T
,,	*Rickmansworth—Moor Park	Lord Ebury	5	2	0	340 ↑
12.	*Welwyn—Danesbury	Col. A. M. Blake, C.B.	8	1	0	400
,,	* ,, Bridge House	B. Wilfred Thomas	5	6	6	228 ?
,,	*Datchworth Rectory	Rev. Andrew Amos	5	1	0	386 T
13.	*Weston—Weston Park	M. R. Pryor	5	0	8	470 T
,,	*Bennington—Desmond Cot.	Miss M. C. Nihill	5	1	0	408
,,	* ,, Bennington House	Rev. Dr. Parker	5	1	0	408 ↑
14.	*Therfield Rectory	Rev. John G. Hale	5	4	3	510 ↑
,,	*Throcking Rectory	Rev. C. W. Harvey	5	1	0	484 T
,,	*Buntingford—Hamels Park	E. Wallis	5	1	0	400 T
15.	*Much Hadham	T. Woodham Mott	5	1	0	222 B
16.	Harlow—Gilston Park	William Cooper	8	0	6	175 T
17.	*Hertford—Bayfordbury	W. Clinton Baker	8	1	2	250
,,	* ,, Sewage Works	W. B. Bryan	8	6	0	125
,,	*Ware—Fanhams Hall	Miss V. M. Croft	8	1	0	235 T
,,	* ,, Red House	Joseph Francis	5	4	0	115 T
18.	*Hoddesdon—Feilde's Weir	W. B. Bryan	8	3	8	95
,,	*Broxbourne—Stafford House	G. J. Newbery	5	1	0	118 T
,,	*Northaw—Northacre	Rev. F. W. Poland	5	1	0	
,,	*Hadley—Risegate	H. E. Freir	5	0	11	340
,,	*New Barnet—Gas Works	T. H. Martin	8	0	9	212

* Daily records received. † For explanation of these symbols see p. 33, *ante*.

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TABLE II.—RAINFALL D

River Districts.	Stations.	Jan.	Feb.	Mar.
		in.	in.	ins.
OUSE / CAM / 1. Rhee	Royston—Melbourne Street	·44	·98	·95
	Odsey	·35	·90	1·00
OUSE / IVEL / 2. Upper Ivel	Baldock—High Street	·43	·99	·95
OUSE / IVEL / 3. Hiz	Preston—The Laburnums	·64	·96	1·56
	Hitchin—The Firs	·53	1·18	1·15
	,, The Maples	·49	1·05	1·11
	,, The Chilterns	·57	1·02	1·04
	,, High Down	·43	·86	1·11
THAMES / THAME / 4. Up. Thame	Tring—Pendley Manor	·65	1·43	1·50
	,, Bulbourne	·62	1·36	1·42
THAMES / COLNE / 6. Bulbourne	Wigginton Vicarage	·72	1·46	1·52
	Cowroast	·69	1·27	1·57
	,, Offside Cottage	·67	1·28	1·47
	Berkhamsted—Rosebank	·81	1·41	1·59
	,, Rose Cottage	·84	1·32	1·62
THAMES / COLNE / 7. Gade	Great Gaddesden Vicarage	·85	1·34	1·49
	Hemel Hempstead—Apsley Mills	1·05	1·45	1·85
THAMES / COLNE / 8. Ver	Kensworth—The Grove	·96	1·22	1·63
	Harpenden—Rothamsted	·78	1·24	1·47
	St. Albans—Gorhambury	·77	1·27	1·69
	,, Herts County Museum	·84	1·22	1·73
	,, Bone Hill	·85	1·21	1·73
	Frogmore—The Cottage	·91	1·27	1·58
THAMES / COLNE / 9. Up. Colne	Elstree—Aldenham House	·86	1·32	1·56
THAMES / COLNE / 10. Lo. Colne	Watford—Weetwood	·91	1·41	1·62
	,, London Orphan Asylum	·99	1·30	1·55
	,, Frogmore	·93	1·39	1·55
	Rickmansworth—Moor Park	·98	1·65	2·04
THAMES / LEA / 12. Mimram	Welwyn—Danesbury	·73	1·22	1·32
	,, Bridge House	·66	1·11	1·42
	Datchworth Rectory	·66	1·11	1·26
THAMES / LEA / 13. Beane	Weston—Weston Park	·57	1·09	1·07
	Bennington—Desmond Cottage	·69	·99	1·33
	,, Bennington House	·60	·91	1·18
THAMES / LEA / 14. Rib	Therfield Rectory	·46	·96	1·15
	Throcking Rectory	·60	·92	1·17
	Buntingford—Hamels Park	·72	·95	1·27
THAMES / LEA / 15. Ash	Much Hadham	·66	1·08	1·52
THAMES / LEA / 16. Stort	Harlow—Gilston Park	·64	1·06	1·51
THAMES / LEA / 17. Upper Lea	Hertford—Bayfordbury	·72	1·26	1·38
	,, Sewage Works	·48	1·00	1·28
	Ware—Fanhams Hall	·59	1·08	1·55
	,, Red House	·57	1·08	1·31
THAMES / LEA / 18. Lower Lea	Hoddesdon—Feilde's Weir	·67	1·10	1·34
	Broxbourne—Stafford House	·70	1·25	1·42
	Northaw—Northacre	·94	1·40	1·47
	Hadley—Risegate	1·03	1·31	1·70
	New Barnet—Gas Works	·93	1·27	1·63
Mean for the County		·71	1·18	1·42

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[ERTFORDSHIRE IN 1902.

APL.	MAY.	JUNE.	JULY.	AUG.	SEPT.	OCT.	NOV.	DEC.	YEAR.	DAYS.
in.	ins.	ins.	ins.	ins.	ins.	in.	ins.	in.	ins.	
·64	2·38	2·68	1·08	4·95	·84	1·38	1·32	1·29	18·93	146
·61	2·26	2·75	·96	4·66	·97	1·05	1·21	1·14	17·86	158
·77	2·22	2·70	1·71	4·18	·97	1·35	1·14	1·22	18·63	141
·76	1·87	2·82	2·14	2·69	1·02	1·43	1·42	·95	18·26	154
·86	2·13	3·54	1·88	4·02	1·87	1·73	1·47	1·35	21·71	166
·72	1·71	3·34	1·84	3·74	2·26	1·62	1·35	1·25	20·48	139
·70	1·71	3·13	2·32	4·11	2·29	1·52	1·37	1·34	21·12	156
·80	2·00	2·88	1·88	3·51	2·71	1·67	1·39	1·35	20·59	165
·91	1·85	2·67	1·41	3·21	1·02	1·64	2·25	1·42	19·96	168
·97	1·84	2·67	1·35	2·91	1·09	1·62	2·18	1·45	19·48	188
·86	1·79	2·43	·98	3·12	1·21	1·74	2·37	1·38	19·58	
·87	2·01	2·58	1·12	3·73	·83	1·72	2·10	1·50	19·99	138
·88	1·98	2·58	1·14	3·69	·85	1·71	2·10	1·48	19·83	155
·91	2·20	2·70	1·05	3·40	·64	1·65	2·26	1·49	20·11	167
·90	2·22	2·85	1·17	3·39	·77	1·77	2·24	1·48	20·57	168
·89	1·95	3·30	1·52	3·64	·88	1·57	1·93	1·23	20·59	163
·79	2·59	2·78	1·28	3·96	·83	1·92	2·06	1·78	22·34	160
·97	2·47	2·87	1·53	3·45	·77	1·78	2·08	1·48	21·21	161
·80	2·11	3·26	1·20	3·40	·94	1·76	1·81	1·35	20·12	163
·70	1·71	3·04	1·07	3·60	1·00	1·73	1·84	1·29	19·71	166
·78	2·05	3·34	1·17	4·15	1·08	1·62	1·84	1·42	21·24	169
·88	2·07	3·46	1·20	3·98	1·24	1·78	1·66	1·32	21·38	175
·71	2·42	3·24	1·27	3·99	1·48	1·52	1·83	1·44	21·66	150
·64	2·04	3·72	1·16	3·44	1·46	1·64	1·98	1·52	21·34	138
·84	2·20	3·53	1·49	4·25	1·13	1·75	2·00	1·49	22·62	180
·70	2·06	3·72	1·51	4·50	1·14	1·57	1·75	1·58	22·37	164
·79	1·98	3·69	1·28	4·76	1·01	1·72	1·83	1·63	22·56	164
·93	2·19	3·47	1·12	4·43	·93	1·91	2·07	1·32	23·04	185
·72	2·61	2·86	2·22	3·45	1·08	1·24	1·51	1·26	20·22	149
·71	2·78	2·70	1·71	3·28	1·03	1·32	1·75	1·43	19·90	161
·75	2·25	2·64	2·30	3·73	1·21	1·31	1·56	1·28	20·06	
·71	2·35	2·61	2·46	3·84	1·30	1·54	1·51	1·37	20·42	179
·73	2·47	2·75	1·47	3·10	·94	1·53	1·14	1·31	18·45	196
·67	2·10	2·64	1·46	3·16	1·34	1·26	1·28	1·34	17·94	185
·72	2·32	2·92	1·32	4·19	1·03	1·33	1·39	1·25	19·04	172
·69	2·13	2·26	1·61	3·39	1·35	1·41	1·21	1·23	17·97	161
·71	2·62	2·81	2·61	3·26	1·59	1·50	1·26	1·25	20·55	131
·71	3·37	2·87	1·94	2·83	1·49	1·42	1·30	1·32	20·51	161
·73	2·98	2·81	1·18	4·03	1·67	1·48	1·42	1·20	20·71	
·85	2·09	2·56	1·13	3·28	·91	1·28	1·59	1·38	18·43	174
·48	1·96	2·59	1·40	3·14	1·95	1·02	1·33	1·18	17·81	134
·72	2·64	2·51	1·53	2·96	·76	1·12	1·62	1·52	18·60	152
·55	2·30	2·45	1·35	2·85	1·16	1·11	1·30	1·25	17·28	155
·60	2·67	2·53	1·13	3·48	1·13	1·09	1·21	1·08	18·03	136
·81	2·80	2·73	1·26	3·99	1·12	1·29	1·35	1·26	19·98	182
·62	2·24	3·17	1·48	2·90	1·32	1·56	1·91	1·55	20·56	172
·75	2·33	3·44	1·25	3·28	1·34	1·70	1·94	1·51	21·58	183
·63	2·23	3·44	1·04	3·20	1·30	1·39	1·88	1·53	20·47	149
·76	2·24	2·95	1·47	3·63	1·21	1·52	1·67	1·36	20·12	162

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TABLE III.—SUPPLEMENTARY TO TABLES I AND II.

District.	Station.	Observer.	Gauge. Diameter.	Gauge. Height above Sea.	Rainfall.	Days.
			ins.	feet.	ins.	
1.	Royston—Workhouse	H. Warren	5	217	18·87	143
,,	Odsey (2nd gauge)	H. G. Fordham	5	256 ↑	17·50	155
4.	Tring—Elm House	E. J. Le Quesne	5	460	17·60	149
6.	Berkhamsted—Fairhill	Miss M. Hopkins	5	548 ↑	19·91	145
,,	,, Rosebank (M)	E. Mawley	8	401 ↑	19·89	
,,	,, Rose Cottage (M)	W. E. Milner	5	334 ↑	20·40	
8.	Harpenden—Rothamsted	A. D. Hall	8	420 ⊤	19·55	156
,,	,, ,,	,,	72 × 87	420 ⊤	20·97	169
10.	Watford—Weetwood (M)	J. Hopkinson	5	269 ↑	22·23	
,,	,, St. Albans Road	H. Ruddle	5		21·90	135
,,	Northwood—Eastbury	H. L. Lewis	5	360 ⊤	20·70	166
,,	,, Easby, ,,	Mrs. S. Fawcett	8	400 ⊤	20·65	158
12.	Knebworth Manor House	Rev. S. R. Wigram	5	420	19·71	142
17.	Hatfield—Holwell House	W. E. Laurie	5	250 ⊤	18·13	

M = gauge read monthly, in each case a second gauge.

Distribution of the Rainfall throughout the County.—The next table (Table IV) gives the mean fall in each month and in the year in each of the five river-districts represented, and in the two main hydrographical divisions of the county, the catchment-basins of the Great Ouse and of the Thames, and also the difference in the year from the mean for the 20 years 1880–99.

TABLE IV.—RAINFALL IN THE RIVER-DISTRICTS.

MONTHS.	CAM.	IVEL.	THAME.	COLNE.	LEA.	OUSE.	THAMES.
	ins.	ins.	ins.	ins.	ins.	ins.	ins.
Jan.	·40	·52	·64	·86	·68	·48	·76
Feb.	·94	1·01	1·39	1·33	1·11	1·00	1·22
March	·97	1·15	1·46	1·63	1·36	1·11	1·49
April	·63	·77	·94	·82	·69	·73	·77
May	2·32	1·94	1·85	2·11	2·46	2·03	2·27
June	2·71	3·07	2·67	3·14	2·77	2·98	2·93
July	1·02	1·96	1·38	1·24	1·59	1·73	1·42
August	4·81	3·71	3·06	3·83	3·37	3·98	3·56
Sept.	·90	1·85	1·05	1·01	1·25	1·62	1·13
October	1·22	1·55	1·63	1·71	1·35	1·47	1·53
Nov.	1·26	1·36	2·22	1·99	1·47	1·33	1·74
Dec.	1·22	1·24	1·43	1·46	1·33	1·24	1·39
Year	18·40	20·13	19·72	21·13	19·43	19·70	20·21
Diff. from 1880–99	−4·43	−4·31	−8·55	−6·40	−5·32	−4·15	−5·97

The mean fall in each of the minor river-basins or sub-districts represented was as follows:—(*Cam*) Rhee, 18·40 ins.; (*Ivel*) Upper Ivel, 18·63 ins.; Hiz, 20·43 ins.; (*Thame*) Upper Thame, 19·72 ins.;

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(*Colne*) Bulbourne, 20·02 ins.; Gade, 21·46 ins.; Ver, 20·89 ins.; Upper Colne, 21·34 ins.; Lower Colne, 22·65 ins.; (*Lea*) Mimram, 20·06 ins.; Beane, 19·94 ins.; Rib, 19·19 ins.; Ash, 20·51 ins.; Stort, 20·71 ins.; Upper Lea, 18·03 ins.; Lower Lea, 20·12 ins.

The rainfall was more uniform over the county than usual. The Ivel river-district had the average fall for the whole county, the Colne had an inch more than the average, and the districts of the Thame, Lea, and Cam had respectively half an inch, three-quarters of an inch, and an inch and a half less than the county average. The rainfall reached at least an inch in 24 hours on five occasions during the year, once in each of the months of May, June, July, August, and September; and there are 21 records of such falls in the aggregate at all stations. Ten of these are in the north of the county, in the Ouse district; ten in the east, in the Lea district; and only one is in the west, in the Colne district.

The total yearly fall ranged from 17·28 inches at the Red House, Ware, to 23·04 inches at Moor Park, Rickmansworth; and the total monthly fall from 0·35 inch at Odsey, in January, to 4·76 inches at Frogmore, Watford, in August. The greatest fall in any one day was 2·21 inches at High Down, Hitchin, on 11th September, and that is the only fall of at least two inches in the year.

Distribution of the Rainfall in each Month.—The nomenclature used in the following accounts of the chief falls of rain in each month is the same as in my previous reports, falls of at least ½ inch being styled *considerable*, ¾ inch *very considerable*, 1 inch *great*, 1¼ inch *very great*, 1½ inch *heavy*, 1¾ inch *very heavy*, and 2 inches *excessive*. Only the forty returns of the daily rainfall are thus analysed, except that falls of at least an inch which were the heaviest in the month are given for all stations. The wettest days in each month are given for all the forty-eight stations.

JANUARY.—A very dry month, with rain or snow on a small number of days, the latter falling on three or four days during the last week only, and to a very small amount. There was no *considerable* fall either as rain or snow. The 1st was the wettest day at 16 stations, the 4th at 17, the 26th at 14, and the 4th and 26th were the wettest at one station.

FEBRUARY.—Rather dry, with rain or snow on rather less than the average number of days. During the first half of the month snow only fell, on three or four days; during the second half, rain only, which was consecutive for the seven days 22nd to 28th, and almost inappreciable before that period. There was no *considerable* fall of either rain or snow. The 22nd was the wettest day at 3 stations, the 24th at 42, and the 26th at 3.

MARCH.—A month of nearly average rainfall on about the usual number of days, with a little snow and hail on two or three days during the last week. A dry period, 10th to 18th, was broken on the 14th by a fall of rain which was *considerable* at 27 stations and *very considerable* at 2. The 13th was the wettest day at 3 stations, the 14th at 44, and the 24th at one station.

APRIL.—Very dry, with rain on rather less than the average

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number of days, and no snow. There was no *considerable* fall of rain. The 5th was the wettest day at 33 stations, the 15th at one station, the 16th at one, the 21st at 9 stations, the 23rd at 2, and the 5th and 21st were the wettest at 2.

MAY.—A month with very little more than the average rainfall, but with nearly twice the average number of wet days, and with snow, hail, or sleet on about seven days during the first fourteen. Rain fell at most stations on every day but three during the first twenty-two days. There was a *considerable* fall on the 22nd at 9 stations, all in the Lea district, and on the 30th the fall was *great* at Much Hadham (1·11 in.). The 3rd was the wettest day at 2 stations (a thunderstorm), the 17th at 3, the 22nd at 37, and the 30th at 6.

JUNE.—Very wet, with rain on a considerable number of days, nearly all during the first twenty days of the month. On the 12th the fall was *considerable* at 13 stations; and on the 13th it was *considerable* at 12 stations, *very considerable* at 13, and *great* at Northaw (1·03 in.), Much Hadham (1·05 in.), and the London Orphan Asylum, Watford (1·09 in.). On the 14th it was *considerable* at 2 stations, and *very considerable* at one station (all in the Colne district); and on the 16th it was *considerable* at one station (Elstree). The 12th was the wettest day at 12 stations, the 13th at 31, the 14th at 4, and the 16th at one station. There were thunderstorms on the 3rd, 7th, 12th, and 16th. At Berkhamsted on the 7th, Mr. Mawley states, rain and hail fell for six minutes at the rate of an inch and three-quarters an hour.

JULY.—A dry month, with rain on a rather small number of days. On the 1st the fall was *considerable* at 8 stations, *very considerable* at 2, *great* at Danesbury, Welwyn (1·02 in.), *very great* at Datchworth (1 29 in.), Preston (1·33 in.), and The Chilterns, Hitchin (1·40 in.), and *heavy* at Weston Park (1·51 in.). The 1st was the wettest day at 29 stations, the 9th at 3, the 10th at 13, the 1st and 10th were the wettest at one station, the 9th and 22nd at one, and the 9th and 25th at one. There were thunderstorms on the 1st and 10th, hail falling on the latter day.

AUGUST.—Much the wettest month in the year, the rainfall being 50 per cent. above the average, and with many wet days. On the 4th the fall was *considerable* at 2 stations (in the Lower Lea district); on the 6th it was *considerable* at 11 stations, *very considerable* at 2, *great* at Royston (1·06 in.) and Baldock (1·14 in.), and *very great* at Gilston Park (1·25 in.) and Odsey (1·33 in.); and on the 7th it was *considerable* at 2 stations and *very considerable* at one station (in the Colne district). On the 17th it was *considerable* at 5 stations and *very considerable* at one station; on the 18th it was *considerable* at 18 stations and *very considerable* at 10 (all in the Colne and Lea districts); and on the 19th it was *considerable* at 3 stations. On the 23rd it was *considerable* at 7 stations, and on the 26th at one station (Moor Park). The 6th was the wettest day at 13 stations, the 7th at 5, the 18th at 23, and the 23rd at 4. There were thunderstorms on the 6th, 7th, and 18th.

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At Berkhamsted on the 6th Mr. Mawley recorded a fall of rain for six minutes at the rate of nearly two inches an hour.

SEPTEMBER.—Very dry, the rainfall being little more than half the average, and with a very small number of wet days, nearly all in the first half of the month. On the 10th the fall was *considerable* at 4 stations. On the 11th it was *considerable* at 9 stations, *very considerable* at 2, *great* at Gilston Park (1·14 in.), *very great* at The Firs, Hitchin (1·33 in.), and Hertford Sewage Works (1·48 in.), *heavy* at The Chilterns, Hitchin (1·73 in.), *very heavy* at The Maples, Hitchin (1·83 in.), and *excessive* at High Down, Hitchin (2·21 ins.). The 2nd was the wettest day at 4 stations, the 10th at 7, the 11th at 35, the 16th at one station, and the 2nd and 11th were the wettest at one.

OCTOBER.—Another very dry month for the time of the year, the rainfall being again only a little more than half the average, but there was about the average number of wet days. The only *considerable* fall of rain was on the 17th, at 7 stations, all in the Colne district. The 9th was the wettest day at 5 stations, the 17th at 41, the 9th and 17th were the wettest at one station, and the 28th and 29th at one.

NOVEMBER.—A dry month, but with rain on nearly the average number of days. There was no *considerable* fall. The 6th was the wettest day at 3 stations, the 24th at 5, the 28th at 12, the 29th at 24, the 30th at 3, and the 6th and 29th were the wettest days at one station.

DECEMBER.—Another dry month, again with rain on but little less than the average number of days, and with no *considerable* fall. The 1st was the wettest day at 8 stations, the 14th at 2, the 15th at one station, the 16th at 3 stations, the 17th at 27, the 28th at 3, the 1st and 15th were the wettest at one station, the 1st and 17th at 2 stations, and the 1st, 17th, and 28th at one station, the only instance in the year of the heaviest fall of rain in a month being equal on three days. Snow fell on several days in the early part of the month, and again on the 30th, but only to a very small amount.

Comparison with the Rainfall of the Adjoining Counties.—The result of a comparison with the rainfall of the adjoining counties again shows an excess for Hertfordshire. The mean rainfall in the year at the same stations, with one or two exceptions, as in the previous year (one to every 40 square miles in each county), was as follows:—Cambridgeshire (21 stations), 18·61 ins.; Bedfordshire (12 stations), 18·47 ins.; Buckinghamshire (18 stations), 20·17 ins.; Middlesex (7 stations), 21·39 ins.; and Essex (33 stations), 19·29 ins.: the average for the whole of the 91 stations being 19·36 ins. This shows an excess for Hertfordshire of about three-quarters of an inch, or nearly 4 per cent., which is much less than it was in either of the three previous years.

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XXIV.

ON THE SHRINKAGE OF THE UPPER SOURCES OF THE RIVER LEA.

By James Saunders, A.L.S.

Read at Watford, 16th December, 1902.

Until about the year 1885 the highest source of the River Lea was situated at Houghton Regis, Beds. There was then a fine body of water, which flowed easterly from that village, and was augmented by copious springs at Icknield Hole in Leagrave parish. Passing thence under the Midland Railway at Leagrave Marsh, the stream was again increased by numerous springs at this place. Flowing easterly it was fed by a tributary called Cats Brook, and again by a fine head of water which originated in Biscot Meadows, situated two miles and a half north of Luton.

By the early part of the year 1902 all these sources had become dry, with the exception of the springs at the north-east corner of Leagrave Marsh. Until the Summer of 1901 the highest source was at the north-west end of Leagrave Marsh, but this has been dry from that period, so that the present highest source of the Lea is about a quarter of a mile to the east of that point, and is situated at the north-east corner of the Marsh, closely adjoining the ancient camp named Wauluds Bank.

There are at this place about a dozen springs which originate in the Lower Chalk. These springs have become very much reduced in volume during the last ten years. Formerly their united outflow produced a rapid stream at least three yards wide and nine or ten inches deep. Now the flow is diminished to about three feet in width and two or three inches in depth.

This is sufficient to form a shallow brook, which flows easterly through Limbury and Biscot, but as it does not receive any additional supply from springs which were formerly very numerous in this part of its course, it gradually diminishes in volume, so that when it reaches the New Bedford Road, a mile and a half north of Luton, its current is very feeble.

Turning thence in a south-easterly course, it continues for nearly a quarter of a mile, when, having reached a point about one hundred yards from Stocking Stone bridge, the stream disappears and the river-bed is quite dry. The shrinkage of water over the last fifty yards is very marked, though there is no suggestion of an aperture through which the water may pass to a lower level. It is as though percolation and evaporation were in excess of the supply received from the higher portions of the river-bed.

At Brammingham Shott, about 200 yards south-east of this point, there is a deep well, the presence of which may partly account for the rapid disappearance of the stream. From this point, which is a few yards north of the boundary of Luton township, the river-bed is dry through the whole of Luton and

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its environs, with the exception of occasional pools of stagnant water, formed by surface-drainage.

The principal cause of the drying up of the river in its course through Luton has been brought to the notice of the writer by Mr. W. R. Phillips, C.E. Towards the close of the nineteenth century the local authorities of Luton completed a new drainage system of much larger capacity than that which had previously existed. Underneath the main sewer, and separated from it by an impervious bed of cement, there was also laid down a storm-water drain of large calibre. The pipes used in its construction were placed end to end with open joints, so that any surface-springs which were tapped would discharge themselves into it. As a natural result of this, there is, at the outflow of the storm-drain, just south of Luton, a copious supply of water, whilst the river-bed above this point, and for a mile and a half higher, is almost dry. Mr. Phillips estimates that under ordinary circumstances and in comparatively dry weather there is a daily discharge of three-quarters of a million gallons of water, which, after several rainy days, is increased to a million and a quarter, an amount equal to the daily consumption of the township as supplied by the waterworks.

A sample of the water taken at the outflow referred to above was submitted to the county analyst, who pronounced it to be good drinking water.

The discharge pipe is situated about a quarter of a mile above the Luton Hoo lake, between which points there is at present (1902) a continuous flow of clear spring-water.

The condition of the stream is very different from that which would exist if it passed through the town in the open bed of the River Lea. It would in that case be subject to constant pollution from various causes; but under the existing arrangement the stream at its exit, excepting after heavy rains, is so bright and clear that the fresh-water Crustacean, *Daphnia pulex*, finds therein a congenial habitat.

During the progress of the work connected with the excavations, the principal cutting for which was nearly parallel with the course of the Lea, numerous springs were met with. In some instances the inrush of water was so copious and sudden that the men employed were compelled to leave their work very hastily. This was notably so at the lower end of the town, where the valley is narrower than it is farther to the north. The united volume of the springs thus interfered with and diverted into the storm-water drain accounts for the amount which it discharges. This has been continuous up to the present, and there are no indications of exhaustion in the near future.

The prime factor in causing the shrinkage of the sources of the Lea is doubtless the diminished rainfall in this district during the last twenty years or so. From records published in the 'Transactions' of the Hertfordshire Natural History Society it appears that the mean rainfall in the upper portion of the valley

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of the Lea within that county for the 24 years 1877–1900 was as follows:—

	ins.			ins.			ins.			ins.
1877	29·21	...	1883	23·56	...	1889	27·50	...	1895	21·38
1878	29·76	...	1884	19·03	...	1890	21·59	...	1896	27·17
1879	28·73	...	1885	27·26	...	1891	27·38	...	1897	22·89
1880	29·04	...	1886	25·36	...	1892	23·02	...	1898	19·06
1881	26·72	...	1887	18·36	...	1893	20·56	...	1899	23·03
1882	27·94	...	1888	24·22	...	1894	24·99	...	1900	22·88
Mean	28·57		Mean	22·96		Mean	24·17		Mean	22·74

The average for the whole period is 24·61 ins., and for the 18 years 1883–1900, 23·29 ins. It should, however, be borne in mind that the first period here given (1877–82) was an abnormally wet one, having a rainfall about four inches above the average of a long period, such as 50 years.

Another factor is subsoil drainage, by which storm-water is carried off much more rapidly than it was before this system became prevalent.

The constantly increasing number of deep wells for municipal and manufacturing purposes must also tend to a general lowering of the plane of saturation over the area in which they exist.

Additional Notes.

Since the above was written evidences have been rapidly accumulating which illustrate the continuous lowering of the water-level in the higher parts of the Lea valley. By the beginning of December, 1902, nearly all the wells at Leagrave had become dry, and sinking operations were general.

At Limbury, about a mile farther down the valley, a well about thirty yards from the river-bed had to be sunk to the depth of twenty-eight feet before water was reached. This deepening was continued to thirty-five feet in order to obtain a copious supply. Fifteen years ago the water-level in this well was only eighteen inches below the surface, so that in the interval the line of saturation has lowered twenty-six and a half feet.

The well at Messrs. Lye's works, just north of Luton, has recently been deepened an extra six feet, a similar operation having been performed two years ago.

The Luton Water Company are discussing the advisability of sinking one of the three borings now existing at their station so as to reach the Lower Greensand. There are strong indications that the demands of the near future will exceed the present supply.

It would probably require several successive years of what is considered the normal rainfall of the district to reverse, or even to arrest, the further serious lowering of the water-level.

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XXV.

SOME RECENT STORMS AND FLOODS IN HERTFORDSHIRE.

By John Hopkinson, F.L.S., F.G.S., F.R.Met.Soc., Assoc.Inst.C.E.

Read at Watford, 16th December, 1902.

Since 1894 there has not been a year with the rainfall appreciably above the average, and with the exception of the years 1896 and 1901 it has been deficient; nor have we recently had any gale nearly so destructive as that of the Spring of 1895. All the storms of sufficient severity to be recorded have been noticed in my annual meteorological reports, but a few have occurred in recent years, notwithstanding the generally small rainfall and absence of severe gales, which should perhaps be more fully recorded in our 'Transactions.'

Accounts of these have appeared in our county newspapers, and I think that the prompt publication of such accounts of meteorological phenomena which they are able to give is much to be commended and encouraged, no apology being needed for the statement that by far the greater part of the following account of these storms is derived from our local Press. Some details of ephemeral or personal interest, not unworthy of record at the time, are here omitted.

The Snow-storms and Floods of February, 1900.—The heavy falls of snow on the 3rd, 10th, and 13th of February have been alluded to on a preceding page (p. 68), but no account is there given of the results of these snow-storms. Of the first there is nothing of importance to record, but it was partly owing to the depth of snow remaining on the ground from that fall that the results of the later falls were so serious, especially the floods which resulted from a heavy fall of rain and rapid thawing of the snow on the frozen ground.

The snow of Saturday the 10th drifted to a great depth in places, and the snow-storm on the evening of Tuesday the 13th, being accompanied by such a high wind that it has been called a blizzard, added greatly to the depth of the drifts, which blocked many of our roads and some of our railways. On Wednesday morning, on the Hitchin and Cambridge line a train stuck fast in a drift between Ashwell and Baldock, and no train got through to Cambridge until about half-past 10 The branch line from St. Margaret's to Buntingford was blocked by snow-drifts on Tuesday night, and it was not until noon on Wednesday that traffic could be resumed. The block on the line from Luton to Dunstable was the worst yet experienced. Gangs of men from the various stations on the line were hard at work clearing it from 3 a.m. to 2.30 p.m., when the first passenger train was got through. In some districts the mails were much delayed; the rural postman from Welwyn had twice to dig himself out of the

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snow on his way to Whitwell. It was several days before many of the roads were cleared of snow sufficiently for vehicular traffic to be resumed, and in some districts a snow-plough was used to cut a way through it.

On Thursday the 15th very heavy rain fell and rapidly thawed the snow, causing floods on Friday, Saturday, and Sunday at many places in the county. On Friday the Baldock Road at Royston was flooded, and cottages were inundated; on Friday night and Saturday morning the lower part of High Street, Watford, was flooded for about a hundred yards from the bridge over the Colne, the water being two feet deep in some places; at Bishop's Stortford the whole of the Town Meads were under water, and the low-lying ground around Sawbridgeworth and Harlow was submerged for some days later; the River Lea overflowed its banks, the meadows in the vicinity of the Chadwell Spring were under water, the Angel Mead near Ware and some of the houses in High Street were flooded, and lower down the valley so also were the Rye House Gardens, Roydon Meads, Admiral's Walk, and parts of St. Margaret's, part of the road through Roydon Mead being four or five feet under water. All the locks on the Lea and Stort Navigation were thrown open in order to allow the water to get away as freely as possible.

The Hail-storm and Flood of the 12th of July, 1901.—The great Watford flood of this date seems to merit a fuller notice than is given of it in my meteorological reports on the year 1901 which have appeared in our 'Transactions' (pp. 152 and 162), where it might also be altogether overlooked. The rain which fell during that day was by no means exceptional in amount; it is the intensity of the fall for a short period which is remarkable.

The wettest day in Hertfordshire of which we have a record was the 12th of July, 1889, when the rainfall exceeded two inches and a half at eighteen stations in the county, was at least three inches at twelve of these, at least three inches and a half at four, and reached nearly four inches at two (3·85 ins. at Danesbury, Welwyn, and 3·91 ins. at Marden Hill, Tewin), but there is no record extant of any great intensity of that fall during a short period.

On this recent occasion the fall exceeded half an inch at the following sixteen stations:—

	in.		in.
Weston Park, Stevenage... ...	0·53	Bridge House, Welwyn	1·10
Datchworth Rectory	0·54	Rosebank, Berkhamsted ...	1·22
Melbourne Street, Royston ...	0·57	Great Gaddesden Vicarage ...	1·30
Therfield Rectory...	0·64	Danesbury, Welwyn	1·45
The Grove, Kensworth	0·65	Rose Cottage, Berkhamsted ...	1·48
Offside Cottage, Cowroast ...	0·72	Callipers, Chipperfield	1·68
High Down, Hitchin	0·73	London Orphan Asylum, Watford	1·89
Apsley Mills, Hemel Hempstead	1·01	St. Albans Road, Watford ...	1·98

On the other hand, no rain fell at Hamels Park, Buntingford; Much Hadham; Bayfordbury, Hertford; Hertford Sewage Works; Fanhams Hall, Ware; The Red House, Ware; Stafford House, Broxbourne; Northacre, Northaw; and the Gas Works, New

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Barnet. It will be noticed that all these places but one are in the south-east of the county; but very little rain fell at some places in the immediate vicinity of Watford, the fall at the Colne Valley Waterworks, Bushey, being only 0·29 in., and at the wettest station in the county, Moor Park, only 0·20 in. No rain fell at Pinner. The local character of the fall is due to its being the result of a thunderstorm, the south-eastern limit of which pretty nearly followed the outcrop of the Chalk from underneath the Reading Beds from a little south of Watford to Bishop's Stortford. It must not, however, be inferred that the geological structure of the country had any influence on the storm, this probably being merely a coincidence.

The following accounts of the storm as it affected Watford are taken from two of our local newspapers, the 'Watford Observer' of the 20th of July being first quoted from, and then the 'Herts Advertiser' of the same date, omitting from that a few statements which are given almost in the same words in the first-named paper.

"The day was intensely hot, and early in the afternoon heavy clouds threatened thunder. Between two and three, lightning began to play and thunder was heard in the distance. About half-past three a few big, heavy drops of rain passed through the sultry, heavy atmosphere. Then hailstones began to rattle down, and in less time than it takes to record it Watford was visited by a terrific downpour of hail and rain, more severe than any other storm called to mind by the oldest inhabitants. The hailstones were of extraordinary size and shape. Some were as large as walnuts and appeared like solid pieces of broken ice. Others were flakes of ice an inch and a half across, which broke when touched like a thin biscuit. Others, again, were round as marbles, and as they struck the pavements bounced to the height of two or three feet. . . . On the roofs this extraordinary hail set up a rattling that was most startling, and on the windows the larger stones fell with sharp cracks that threatened broken glass. In the gardens plants and vegetables were beaten down and the leaves of the larger varieties were perforated, while the corn crops of the neighbouring farmers suffered much damage. But it was the rain which did the most harm to the town itself. For weeks the ground had been parched, and vegetation had become brown and baked and scorched. The water could not struggle fast enough out of the spouts, and so overflowed from the roof-guttering and poured across windows and down walls and into cellars. It roared down the street gutters like a river. . . . The storm-water drains were quite inadequate to the demand made upon them, and scores of cellars of houses which stand in declivities were flooded with from one foot to five feet of water. The rapidity with which the water came into these houses was remarkable. In one instance the furniture in a kitchen in Queen's Road was floating in four feet of water in a little over ten minutes from the time when the storm began. The station square took in the floods from the roads which run into it like a huge drain, and the subway became a water-way two

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feet in depth. The booking and parcel offices were washed out, and sundry packages were to be seen floating about in the muddy tide, through which the more adventurous porters waded up to their knees. . . . Along the Queen's Road at its lowest part the house of Mr. Drennen was flooded. The water turned off from the gutter through the gateway and rushed down some stone steps into the ground floor, and its force may be gathered from the fact that the door, which was fastened, was burst open, the lock being broken. . . . Several other houses in the same locality were in a plight almost as bad. . . . The services of the Fire Brigade were afterwards requisitioned to pump the water from the houses. . . . The storm did not extend to Bushey. The hail and rain fortunately did not last long, but the thunder and lightning continued through the evening."

The St. Albans paper gives a somewhat similar account of the storm at Watford, differing a little in detail.

"The morning opened well, and everything was bright and fine until after dinner-time, when the sun was hidden every now and again behind a thick thunder-cloud. Vivid flashes of lightning were to be seen in the distance, and the distant rumbling of thunder was heard. The lightning became nearer and seemed to increase in its force, and thunderclaps became heavier. Shortly after three o'clock the pavements and slates were spotted with large drops of water, and before the tradesmen could get their goods inside there was a terrific downpour of rain, accompanied with hail-stones, and their goods suffered severely as a result. . . . Queen's Road presented a remarkable sight, for at the lowest-lying portions there were about two or three feet of water. The storm-drains were not capable of coping with such a terrific rush of water, and as a consequence it flowed over the pavement into the houses on the lower side of the road. It was soon pouring like a torrent into the houses, the windows being smashed, . . . [A detailed account follows of damage done at a number of houses, and of the flooding of the Watford Junction station.] It is strange to relate, but there was practically no hail or rain on the other side of Bushey Arches."

The cause of this severe flooding was undoubtedly the great amount of rain which fell in a short period, nearly the whole of the day's fall coming down in torrents in less than an hour. At the London Orphan Asylum, Watford, 1·78 in. fell in an hour and a quarter, and in less than that time 1·85 in. fell at 105, St. Albans Road. Another gauge in the town is said to have collected 1·88 in. in three-quarters of an hour, which is at the rate of over two and a half inches per hour in that period, an unprecedented record for any part of the county. An inch of rain in depth gives a weight of water of 64,636 tons per square mile (= nearly 101 tons per acre). Taking the mean fall over a square mile in that part of Watford where the downpour was heaviest at the moderate computation of an inch and a half in an hour, there fell in that time in this area nearly one hundred thousand tons of water (96,954),

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and on each acre upwards of 150 tons, while the fall where heaviest must have been at least 200 tons to the acre, or over three tons per minute continued for an hour.

The Gale of the 6th of October, 1901.—For an account of this gale I have to rely upon a newspaper report, but I think it is worth a few lines being given to it in our 'Transactions.'

The 'Herts Advertiser' of the 20th of October gives the following graphic account:—"From its elevated situation it would have been unreasonable to suppose that St. Albans would escape the fury of the storm which, during Sunday, swept over our island. . . . It seems to have shared the full force of the gale, and, with the surrounding neighbourhood, to have suffered considerable damage. During the dull, cheerless morning the wind seemed to be gathering force, and about mid-day it had summed up sufficient vigour to blow 'great guns.' It howled piteously around the houses, and thundered spitefully at the windows, sweeping before it all the foliage which was preparing to fall, and dislodging decayed branches in the trees wherever found. Tiles and slates, too, were displaced and came crashing down into the deserted streets; while the rain, which at times descended in torrents, had the effect of cleansing the roadways of much of their objectionable mud remaining from the previous downfall. In the gardens much havoc was wrought. The bulk of the ungathered fruit was hustled down and badly bruised, and the trees themselves did not escape damage in a good many instances. In exposed places dahlias and other plants were hopelessly beaten down, while the deluge of rain caused temporary rivers to flood the pathways and tear up the gravel in its hurry to find its proper level. . . . One of the tall trees which stud the fence dividing one of the Heath Farm meadows from Sandridge Road, towards mid-day on Sunday, yielded to the tremendous force of the gale, and, reeling in an easterly direction, fell with a tremendous crash against the front of the cottages on the opposite side of the road. [Then follows an account of the damage done to the cottages.] Three or four large branches of one of the elm-trees situated at the corner of Church Crescent and Verulam Road, in the garden surrounding the St. Albans Hospital, were also torn off by the wind, and, falling heavily upon the fence, wrought considerable damage. . . . Another tree in the Marlborough Road was also shorn of one of its arms, and everywhere branches, either large or small, were littered about the paths and roadways.

"At Windridge a tree was blown across the road, and another in Oaklands Park was uprooted. Between St. Albans and London Colney the trees suffered considerable damage. Several heavy branches were dislodged in the neighbourhood of St. Michael's, . . . Numerous large branches were severed from trees in Cassiobury Park, Watford, and some trees there were uprooted. . . . At Hedges . . . three fine elms have constituted a striking landmark and an ornament to the neighbourhood for many years . . . one of these splendid trees was blown down."

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The gale was also severely felt between Redbourn and Luton. A large branch from one of the fine elms on Redbourn Common was blown down, and also a large tree on the top of the hill on the road between Markyate Street and Luton. My own garden at Watford suffered, a conifer being uprooted which had withstood the storms of nearly thirty years, having been planted in 1873.

This is the severest gale which has visited Hertfordshire since that of the 24th of March, 1895, of which an account was given in Vol. VIII of our 'Transactions' (pp. 199–202).

XXVI.

THE METEOR OF THE 13TH OF JULY, 1902.

Read at Watford, 16th December, 1902.

As seen at Watford.—Standing in my garden and facing south-west, I saw on my left a sudden flash of intensely bright white light casting a strong shadow. Immediately turning round, I saw the meteor as a ball of light disappearing behind a tree and leaving a trail which simultaneously became sinuous, changed from nearly white through red to violet, and resolved itself into a chain of separate points of light or "stars," and on their fading away the impression was left on the retina (perhaps an illusion) of a dark line in the sky. The time was between 10.30 and 10.31 p.m., the direction south-east, the trail passed through an angle of from 50° or 55° to 40° with the horizon, and inclined to the right or south about 10° or 12° with the vertical, and it was visible from 5 to 10 seconds as nearly as I can estimate.—*John Hopkinson.* (From Symons' 'Monthly Meteorol. Mag.,' vol. xxxvii, p. 143.)

As seen at Hitchin.—Whilst walking with my wife and a friend on Sunday night, we were astonished by a sudden and brilliant light, very similar in character to the acetylene light, which threw deep shadows of ourselves on the road. Turning round, I was just in time to see a ball of light, of about the [apparent] size of the full moon, high in the south-east, falling towards the south. It left a trail of considerable length, serpentine and of a reddish hue, which lasted some 10 or 15 seconds. The time was 10.32. The meteor had an elevation of about 45° above the horizon.—*Frank Latchmore.* (From 'Hertfordshire Mercury,' 19th July, 1902.)

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